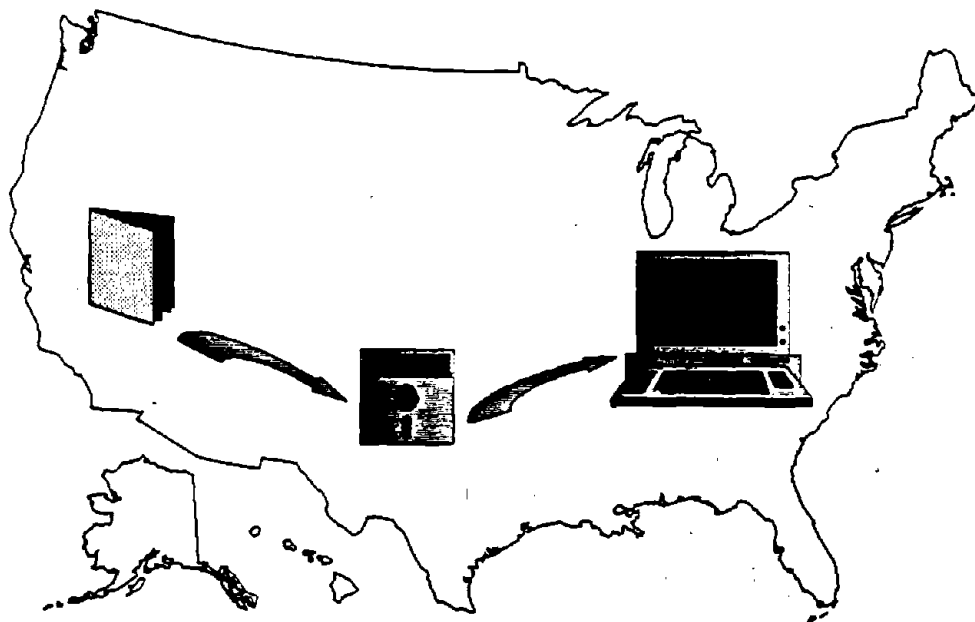




# National Radon Database

## Volume 6: National Residential Radon Survey

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**NATIONAL RADON DATABASE  
DOCUMENTATION  
Volume 6**

**The National Residential  
Radon Survey**

**U.S. Environmental Protection Agency  
Washington, D.C. 20460**

**Sharon White  
Work Assignment Manager**

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## 1.0 Introduction

The National Radon Database has been developed by the U.S. Environmental Protection Agency (EPA) to distribute information collected in two recently completed radon surveys:

1. The EPA/State Residential Radon Surveys, Years 1 to 6; and
2. The National Residential Radon Survey.

The State Residential Radon Surveys were conducted in 42 states and 6 Indian lands to characterize the state-wide distribution of radon screening measurements in the lowest livable area of owner-occupied homes. The National Residential Radon Survey was designed to provide an estimate of the national frequency distribution of annual average radon concentrations in occupied residences. Data and documentation for each survey are available through the National Technical Information Service (NTIS).

### 1.1 GOALS OF THE NATIONAL RESIDENTIAL RADON SURVEY

*This is a national survey of the annual radon levels in all residences across the U.S. This survey is statistically valid at a national and federal region level.*

Exposure to radon and its decay products inside homes is now recognized as a potential public health problem. In enacting the Superfund Amendments and Reauthorization Act (SARA, Section 118(k)) on October 17, 1986, Congress included a requirement for the Administrator of the EPA to conduct a national assessment of radon gas "found in structures where people normally live and work; including educational institutions." As part of this national assessment, EPA was instructed to "assess the levels of radon gas that are present in such structures."

EPA responded to this mandate by designing the National Residential Radon Survey (NRRS). The main objective of this survey was to characterize the distribution of long-term radon concentrations in residences throughout the nation.

Research Triangle Institute (RTI) supported EPA in this effort. Assistance was provided in survey design, interviewer training, sample selection, data processing, and data analysis. The Agency provided the alpha-track detectors used in the surveys and also provided for all laboratory analysis.

The NRRS survey was conducted in 1989-1990 in two phases. Phase I of the survey concentrated on survey design and implementation, identifying households to be sampled, interviewing residences of those households, and placement of the detectors. The NRRS utilized alpha-track detectors for estimating annual average radon levels in the selected homes. Every floor of the home had at least one radon detector placed in an appropriate area for the measurement of that floor's annual average radon level. Phase II involved three rounds of panel maintenance, final detector collection, data analysis, and the production of a final report in three volumes.

### Phase I

**Identifying the Sample --** The NRRS survey population contained only residential households, whether detached or multi-unit, single or multi-family, owner-occupied or rental. To identify individual participating households, a three-stage area probability sampling strategy was used. The first area of focus was the primary sampling unit (PSU), which consisted of Census-defined counties or county equivalents. The secondary sampling units (SSU) consisted of Census-defined blocks or enumerations districts.

**Obtaining Participants --** A random systematic sample of a specified number of listed housing units (HUs) was selected from each SSU. The 11,423 HUs were visited by experienced field interviewers to determine participation in the survey, complete the

NRRS questionnaire, and place the radon detectors. A total of 2,515 HUs did not meet the eligibility requirements of the NRRS. (To meet the eligibility requirements of the NRRS, the residents were required to have no firm plans to move within 12 months and intentions to occupy the residence for at least 9 months out of the following year.) Of the 8,444 eligible HUs, 84 percent (7,118) of the occupants fully cooperated by completing the questionnaire and having detectors placed in their homes.

## Phase II

One of the primary tasks of Phase II of the NRRS was to conduct panel maintenance of the participating households. This was accomplished through postcards and follow-up telephone calls for three periods during the year-long detector deployment period. The purposes of these contacts were to verify the participation of the residents, confirm that they would continue to inhabit the same residence, convey a positive sense of participating in a valuable research venture, and determine if any problems existed with the detection devices. At the end of the monitoring period, 5,694 (80%) of the 7,118 homes returned their detectors. This was well above the target value of 5,000 homes required to meet the survey precision requirements.

The detectors were retrieved through the mail during the summer of 1990. Homeowners were informed of their radon levels and various statistical analyses were performed on the data. The estimates produced by the NRRS and a discussion of the survey design, household questionnaire, and the relationship of building characteristics to radon levels were reported in the NRRS Statistical Analysis (Final report, 1992, three volumes).

The NRRS produced estimates of the annual average radon levels for homes throughout the United States, including estimates for different components of the housing stock. For homes covered by the survey, there were four definitions used to estimate annual averages: (1) lowest lived-in level; (2) average concentration over all lived-in levels; (3) average concentration over all lived-in levels weighted for resident occupancy rates for

different home levels, and (4) average concentration in the lowest level of non-living space. An individual's risk of getting lung cancer from radon is directly proportional to his or her integrated exposure throughout his/her home on all levels. Therefore, the third approach represents the ideal way to assess annual averages in a home to estimate human exposure to radon levels. However, EPA believes that many respondents were unable to provide answers to the survey questions that could form the basis for meaningful results. Therefore, **EPA used the average concentration over all lived-in housing levels to estimate the annual average radon level and other important statistics about radon levels in the housing stock.**

**From the NRRS, EPA estimates that:**

- **Although most U.S. homes have relatively low annual average radon levels, a significant percentage of homes have levels that are much higher than ambient radon concentrations. The median ambient radon level is about 0.4 pCi/L.<sup>1</sup> About 64 percent of all homes have annual average levels below 1 pCi/L. Of the remaining homes, 20 percent have annual average levels between 1 to 2 pCi/L and 16 percent have radon levels greater than 2 pCi/L.**
- **The annual average radon concentration in the U.S. housing stock is 1.25 pCi/L. The median value of the distribution is 0.67 pCi/L and the geometric mean is 0.57 pCi/L.**
- **About 6 percent of U.S. homes have annual average radon levels greater than 4 pCi/L. This radon concentration is the action level at which EPA recommends homeowners act to reduce the amount of radon in their homes. Therefore 5.8 million homes in the U.S. in 1990 had radon levels that homeowners should mitigate.<sup>2</sup> Although 6% of the housing stock has**

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<sup>1</sup> Hopper, R. April 1991. National Ambient Radon Study, Proceedings of the 1991 International Symposium on Radon and Radon Reduction Technology, U.S. EPA, Office of Radiation Programs, Las Vegas Facility.

<sup>2</sup> Based on 97.1 million single family, multi-family, and mobile homes that were regularly used (i.e., occupied year-round and not seasonally used) in the U.S. in 1990 (Census Bureau, 1991). Institutional housing units (i.e., group quarters), which were not

levels above 4 pCi/L, residents of these homes receive about 1/3 of the public's exposure to radon.

- **About 0.7 percent of U.S. homes have annual average radon levels greater than 10 pCi/L.** This estimate of homes over 10 pCi/L has a relatively large sampling error, due to the size of the NRRS sample and the small number of homes in the sample over 10 pCi/L.
- **Apartments or condominiums above the second floor seldom had radon concentrations above EPA's action level.** EPA does not encourage residents of apartments or condominiums (e.g., multi-unit structures) above the second floor to test. The Agency recommends residents of single-family homes, multi-unit structures below the third floor, and mobile homes with permanent foundations to test for radon.
- **Single-family detached homes are four times more likely to require mitigation than multi-family homes.**
- **Every EPA Region has a significant number of homes that need radon mitigation, although some Regions have much greater percentages of homes over EPA's action level of 4 pCi/L.** Each EPA Region contains anywhere from tens of thousands to more than a million homes where residents should reduce their radon levels. In two Regions, the percentages of homes over the action level were well over twice the national average of 6 percent.

The results of the NRRS have been used by EPA to 1) establish a baseline for actions to reduce radon levels, 2) improve the risk estimates and levels of uncertainty concerning radon's contribution to lung cancer deaths per year, 3) provide corroborative evidence that a home's location is a key factor in predicting residential radon and confirm EPA's emphasis on developing mitigation methods for single-family homes, and 4) influence protocols for radon testing, especially as it relates to the 1992 Citizen's Guide to Radon and the Home Buyers and Sellers Guide to Radon.

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included in the NRRS, are excluded from this estimate. They may represent another 3 million housing units at colleges, military reservations and other facilities using dormitory-style housing arrangements.

This documentation for the NRRS database contains information about the survey and a summary of the data collected by the survey. The documentation includes an overview of the sample design and summarizes the final results of data collection and detector retrieval; the procedures used for estimation, weight adjustments, and imputation of missing radon measurements; and definitions of the radon variables and questionnaire data contained in the database. Appendix A contains instructions for installing the database on an MS-DOS personal computer. Appendix B contains a detailed description of the data fields included for each house surveyed. Appendix C contains the survey questionnaire.

## 1.2 SUMMARY OF SURVEY RESULTS

Results of the NRRS are statistically valid at the national level and at the regional level. The location of each EPA region is shown in Figure 1.

Selected statistics obtained from the NRRS are presented in Table 1-1 for the nation as a whole. Estimates of the arithmetic mean, median and geometric standard deviation are tabulated for each of the four types of radon measurements contained in the database.

Table 1-2 contains estimates of the percentages of houses in various radon intervals and the number of homes estimated to be over 4 pCi/L for the nation as a whole and for each of the 10 EPA regions. Figure 2 shows the arithmetic mean and median annual average radon concentrations estimated for each region.

1-7

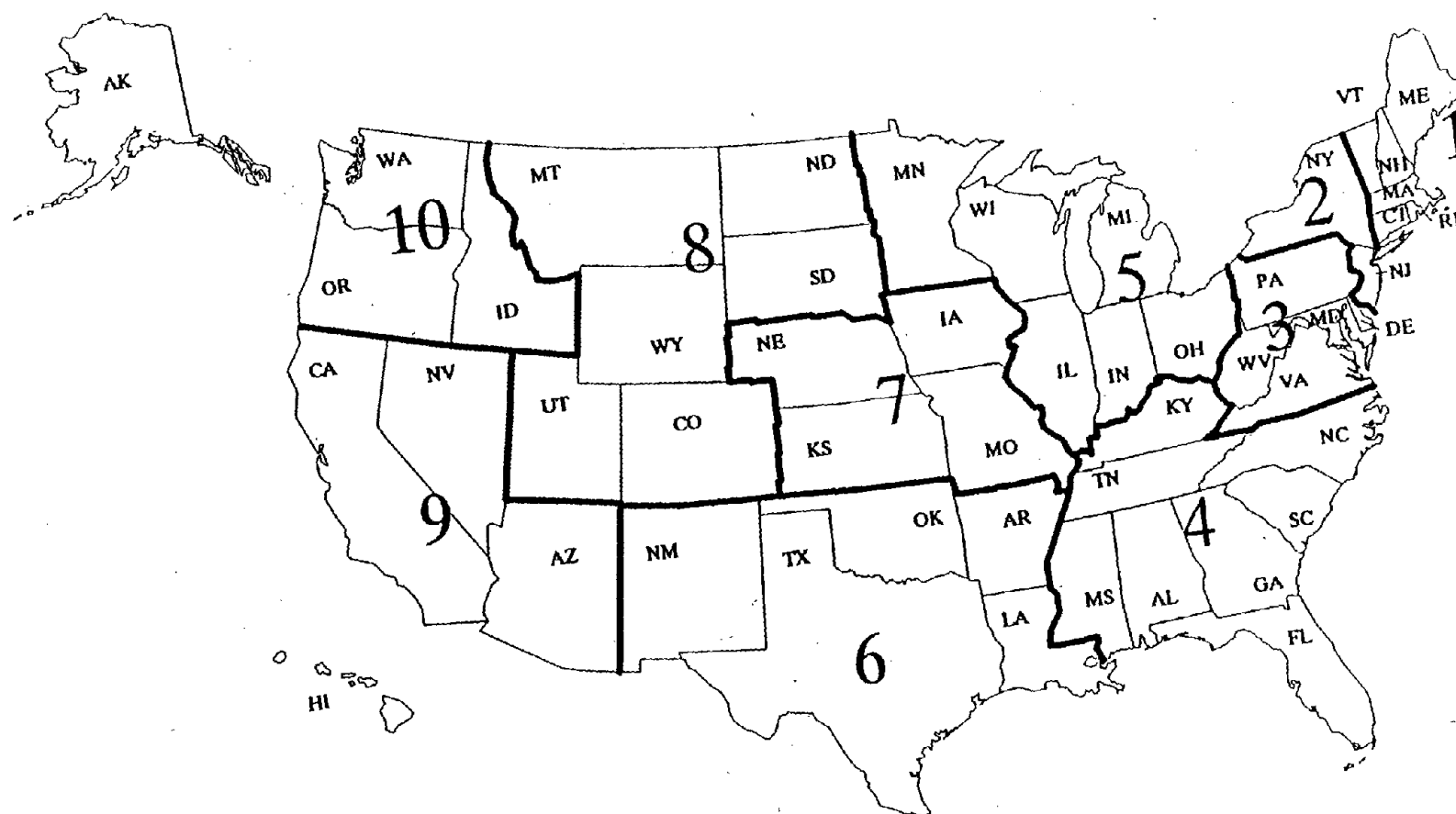


Figure 1. EPA Regions

Table 1-1  
Estimates of Selected Parameters  
of the Distribution of Annual-Average Radon Concentrations  
in Year-Round Occupied Housing Units: United States, 1989-1990

Radon Parameter	Arithmetic Mean	Median <sup>(1)</sup>	Geometric Standard Deviation
Lowest Level of Living Space			
Estimate	1.44	0.72	3.31
(Std. Err.)	(0.07)	[0.66, 0.77] <sup>(2)</sup>	(n.a.)
No. of Houses	5,694	5,694	5,694
Lowest Level of Nonliving Space			
Estimate	3.45	2.14	2.85
(Std. Err.)	(0.25)	[1.90, 2.51] <sup>(2)</sup>	(n.a.)
No. of Houses	1,436	1,436	1,436
Average Over All Living Levels			
Estimate	1.25	0.67	3.11
(Std. Err.)	(0.06)	[0.62, 0.72] <sup>(2)</sup>	(n.a.)
No. of Houses	5,694	5,694	5,694
Weighted Average Over All Levels			
Estimate	1.17	0.64	3.08
(Std. Err.)	(0.06)	[0.58, 0.71] <sup>(2)</sup>	(n.a.)
No. of Occupants	15,788	15,788	15,788

Notes: (1) Estimate of Geometric Mean; (2) 95% confidence interval for the median as opposed to the standard error; n.a. - Not available.



**Table 1-2 Estimated Distribution of Annual Average Radon  
Levels by EPA Region Over All Living Levels**

Region\pCi/L	0-1	1-2	2-3	3-4	>4	Homes > 4 pCi/L
<b>Region I</b>						
Percent	63.7	19.8	8.1	4.3	4.1	
(Std. Err.)	(6.45)	(2.30)	(2.72)	(1.75)	(1.14)	212,000
No. of Obs.	212	77	31	16	19	
<b>Region II</b>						
Percent	77.4	11.7	4.6	2.3	3.9	
(Std. Err.)	(6.14)	(2.55)	(1.35)	(1.36)	1.34	382,000
No. of Obs.	495	73	28	13	23	
<b>Region III</b>						
Percent	65.0	18.8	5.4	3.4	7.4	
(Std. Err.)	(5.51)	(3.13)	(1.14)	(0.77)	(2.17)	750,000
No. of Obs.	483	176	55	33	63	
<b>Region IV</b>						
Percent	66.4	20.9	5.5	2.4	4.8	
(Std. Err.)	(3.78)	(2.51)	(0.57)	(0.47)	(1.78)	867,000
No. of Obs.	488	180	57	31	45	
<b>Region V</b>						
Percent	48.0	24.6	12.0	6.2	9.2	
(Std. Err.)	(2.53)	(1.48)	(0.79)	(0.67)	(1.56)	1,644,000
No. of Obs.	680	380	194	101	149	
<b>Region VI</b>						
Percent	75.6	16.9	3.8	1.0	2.7	
(Std. Err.)	(2.33)	(2.20)	(0.76)	(0.36)	(1.02)	303,000
No. of Obs.	293	86	18	5	17	
<b>Region VII</b>						
Percent	30.4	31.0	12.4	9.4	16.8	
(Std. Err.)	(9.72)	(3.60)	(3.78)	(2.16)	(6.94)	814,000
No. of Obs.	93	98	38	30	55	
<b>Region VIII</b>						
Percent	34.0	23.7	14.0	8.3	20.1	
(Std. Err.)	(13.06)	(3.12)	(3.99)	(2.90)	(6.13)	604,000
No. of Obs.	78	70	43	26	62	
<b>Region IX</b>						
Percent	73.3	19.7	4.0	2.4	0.7	
(Std. Err.)	(4.92)	(2.80)	(1.14)	(2.18)	(0.42)	92,000
No. of Obs.	299	72	11	5	3	
<b>Region X</b>						
Percent	84.9	11.4	1.7	0.6	1.4	
(Std. Err.)	(6.55)	(6.61)	(1.61)	(0.59)	(1.27)	50,000
No. of Obs.	131	38	13	5	3	
<b>United States</b>						
Percent	63.6	19.9	6.9	3.7	6.0	
(Std. Err.)	(1.59)	(0.88)	(0.42)	(0.39)	(0.68)	5,836,000
No. of Obs.	3,252	1,250	488	265	439	

Note: EPA designed the survey to obtain a relative standard error (RSE) (Standard error + values) of no more than 0.5 for its Regional estimates of the percentage of homes greater than 4 pCi/L, if the estimate is close to 7 percent of homes. For EPA Region I through VIII the RSEs are below 0.5. For EPA Regions IX and X the RSEs are .6 and .9, respectively. This is due to the small number of observations found above 4 pCi/L. The relatively large standard errors for these two regions indicate there is greater uncertainty around the estimates provided in this table relative to the other Regions. Numbers do not total due to rounding error.

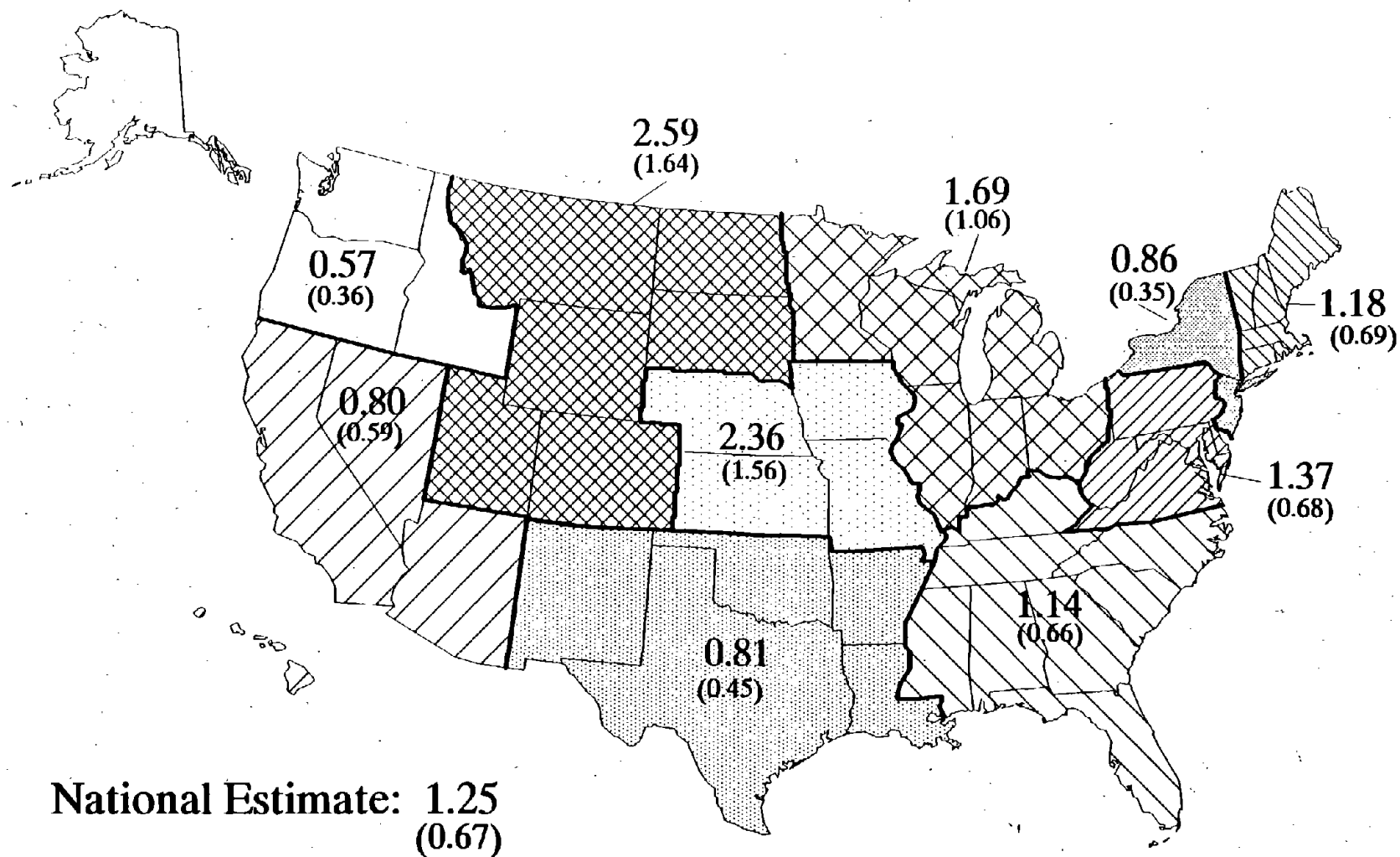


Figure 1-2 Arithmetic Mean (pCi/L) and Median (in parenthesis) of the Distribution of Annual-Average Radon Concentrations Over All Living Levels by EPA Region

## 2.0 The National Residential Radon Survey Design

Both the survey design and the sample design for the NRRS were described in detail in *The National Residential Radon Survey Design Report*, May 1989. Additional documentation is also given in *Guidelines for Developing the Statistical Analysis Plan*, September 1989. This section summarizes the documentation contained in the two referenced reports.

### 2.1 THE TARGET POPULATION

The total nation, including all 50 states and the District of Columbia but excluding all territories and possessions, was partitioned into counties or county equivalents. The NRRS targeted this entire geographical area, except for a portion of the State of Alaska. Because of the great difficulty and expense associated with covering the sparsely settled rural areas of Alaska, only the more populated areas of that state were included in the target population, covering over 85 percent of the estimated number of occupied housing units in Alaska.

The NRRS targeted the national population of housing units and their permanent residents. Excluded from the NRRS sample were all places of residence on military bases, all institutional residences of the institutionalized population such as prisons or mental hospitals, and all "other" types of living quarters such as dormitories. In addition, to avoid including vacation homes, a housing unit had to be "lived in" at least 9 months of the year to be survey eligible as a "principal" residence.

The target population for the NRRS was therefore restricted to:

- a) Housing units
  - that were principal residences
  - whose residents did not all have firm plans to move within 12 months
  - that were continuously occupied for at least 9 months
  - at were not located on military reservations or in the 15 designated county equivalents in Alaska and
- b) Permanent residents of the housing units that met all of the above criteria.

Note that this definition included non-ground-contact housing units. Most other radon surveys are limited to only ground-contact housing units.

## 2.2 STRATIFICATION

The U.S. was partitioned into 22 strata. The 22 strata were developed to guarantee specified minimal sample sizes for the ten EPA Regions and to improve the statistical efficiency of the sample design. In each region, counties or their equivalents were assigned to one of three radon potential categories, High, Medium, or Low, using the information outlined below:

- Data from the first two years of State/EPA Residential Radon Surveys.
- The results of alpha-track testing by Landauer and Terradex, presented at the Radon Symposium in Denver in October 1988.
- Grouped counties within States with similar geographic location and terrain into the same stratum to form contiguous areas.

The three levels were not defined using absolute cut-off points but are subjective relative rankings based on the above information. The 22 strata are describe in Table 2-1.

The PSUs in each stratum were ordered using the following 1980 Census information:

- Whether or not the PSU was part of a Standard Metropolitan Statistical Area (SMSA)
- Percent of HUs located in areas classified as urban
- Percent of HUs with warm air furnace or heat pump
- Percent of HUs with utility gas.

The ordering was controlled so that these characteristics were as similar as possible for adjacent PSUs on the frame.

The first two factors were used to control the sample by degree of urbanization. The third and fourth factors were used to control the sample by heating and ventilation characteristics that affect radon concentrations in housing units.

### 2.3 SAMPLE ALLOCATION AND SELECTION

The sample was selected in three stages. First, Primary Sampling Units (PSUs) defined as a county (equivalent) or a group of counties (equivalents) were selected. Second, each sample PSU was partitioned into small geographic areas called Secondary Sampling Units (SSUs) such as a city block. A random sample of SSUs was selected from each sample PSU. Third, the housing units (HUs) in each sample SSU were listed and assigned to a line number. The sample HUs were then selected by taking a random sample of the line numbers.

Table 2-1  
Definition of the Twenty-Two Design Strata

EPA Region	Expected Radon Level	Stratum ID Number	State/Substate Area
Region 1:	High:	013	ME, NH, VT
	Medium:	012	MA, CT, RI
Region 2:	High:	023	Northern NJ
	Medium:	022	NY
	Low:	021	Southern NJ
Region 3:	High:	033	PA, Western MD, WV, Western VA
	Low:	031	DE, Central and Eastern VA, Eastern MD, DC
Region 4:	High:	043	Western NC, Western SC, Northern GA, Northern AL, Eastern TN
	Medium:	042	KY, Western and Central TN
	Low:	041	Central and Eastern NC, Eastern SC, Southern GA, Southern AL, MS, FL
Region 5:	High:	053	MN, WI, IL, IN, OH
	Low:	051	MI
Region 6:	High:	063	NM
	Medium:	062	OK, Western and Central TX, Northern AR
	Low:	061	LA, Southern AR, Southeastern TX
Region 7:	High:	073	NE, IA
	Medium:	072	KS, MO
Region 8:	High:	083	MT, WY, UT, CO, ND, SD
Region 9:	High:	093	NV
	Low:	091	CA, AZ, HI
Region 10:	High:	103	AK, ID
	Low:	101	WA, OR

When a sample SSU had an extremely large number of HUs, over 150 for example, it was subdivided into subsegments, one of which was randomly selected for listing. The sample line numbers were then selected from that portion of the SSU that was listed. All HUs associated with each sample line number were included in the NRRS to be screened for survey-eligibility.

The number of sample PSUs, SSUs, and line numbers are shown in Table 2-2 by the 22 strata and their totals. These numbers differed slightly from those in the planned design. The planned allocation was based on an optimization procedure that employed approximate stratum sizes. When the PSU sampling frame was actually constructed, the stratum sizes were slightly different, bringing about minor adjustments in the sample allocation.

A probability sample of the designated number of PSUs was selected for each stratum. Each PSU was selected with probability proportional to its estimated number of 1988 occupied housing units using a sequential selection procedure.

Within each sample PSU, SSUs were arranged in a serpentine order on urbanization, house value, and percent of owner occupied HUs. The ordering was to control the sample SSUs by the three characteristics. Exactly 8 SSUs were selected from each PSU with probability proportional to their 1980 Census counts of occupied HUs.

Exactly 8 SSUs were selected in each PSU, yielding a total of 1,000 sample SSUs. Because 7 of the 1,000 SSUs were wholly located on military reservations, however, they were not listed, reducing the number of SSUs to 993. Within each of the 993 sample SSUs that contained survey-eligible HUs, a specified number of listed lines were selected random systematic selection procedure. The counts shown in the column headed "No. of Lines Selected" in Table 2-2 represent the total number of sample lines selected in each stratum.

Table 2-2  
Sample Sizes and Allocation

EPA Region	Radon Class	Stratum ID Number	No. of PSUs Selected	No. of SSUs	No. of Lines Selected	Pop % of HUs	Samp % of HUs
1	High	013	3.0	24.0	251.0	1.2	2.2
1	Med	012	5.0	40.0	423.0	4.1	3.8
2	High	023	4.0	32.0	384.0	2.3	3.4
2	Med	022	8.0	64.0	768.0	7.4	6.8
2	Low	021	2.0	16.0	192.0	0.8	1.7
3	High	033	15.0	120.0	1,253.0	7.8	11.1
3	Low	031	2.0	15.0	192.0	2.6	1.7
4	High	043	7.0	56.0	590.0	3.0	5.2
4	Med	042	3.0	24.0	288.0	3.1	2.6
4	Low	041	7.0	56.0	672.0	12.1	6.0
5	High	053	30.0	239.0	2,639.0	15.1	23.4
5	Low	051	2.0	16.0	192.0	3.7	1.7
6	High	063	2.0	15.0	168.0	0.6	1.5
6	Med	062	5.0	40.0	480.0	5.2	4.3
6	Low	061	3.0	24.0	288.0	5.5	2.6
7	High	073	4.0	32.0	339.0	1.9	3.0
7	Med	072	3.0	24.0	288.0	3.1	2.6
8	High	083	6.0	47.0	503.0	3.1	4.5
9	High	093	2.0	16.0	192.0	0.5	1.7
9	Low	091	8.0	61.0	768.0	13.2	6.8
10	High	103	2.0	16.0	192.0	0.6	1.7
10	Low	101	2.0	16.0	192.0	3.1	1.7
Total			125.0	993.0	11,254.0	100.0	100.0

No. of Expected HUs with radon level > 4 pCi/L = 491.6

No. of Expected HUs with radon level > 10 pCi/L = 36.3



The number of sample line numbers allocated to each SSU varied due to changes in the number of HUs in the SSUs since 1980 Census. To try to minimize the variation in the sampling weights, the number of sample lines allocated to each SSU was based on the probability that the SSU was selected and the number of listed lines in the SSU. A total of 11,254 sample lines were selected.

#### **2.4 DATA COLLECTION, DETECTOR PLACEMENT, AND RETRIEVAL**

After the field interviewers (FIs) were thoroughly trained in the sampling and data collection protocols, they visited each of the 11,254 sample addresses. When the FI visited the address listed for a sample line number, she included all HUs at the address and all HUs between that address and the "next listed" address. This procedure "corrected" the listings, permitting every HU in the SSU a chance for inclusion in the sample, even those HUs that were hard to identify and therefore were missed during listing. Use of this "half open interval" procedure for including HUs missed in the listing allows more than one HU to be linked to a sample line. This procedure identified 169 sample housing units that were missed during the listing giving a total of 11,423 sample lines.

Upon contacting the occupants of each samples HU, the FI gave a short introduction describing the objectives of the study and solicited the cooperation of each occupied residence. Once the occupant agreed to cooperate, a few brief questions were asked to ascertain if the HU was eligible for the study. If the HU was not eligible, the occupant was asked to answer a few more questions and then thanked for his cooperation.

If the respondent was eligible, the FI proceeded to administer the questionnaire. Upon completion of the questionnaire the FI asked the occupant to place alpha-track detectors in the residence according to the established protocols. The interview was concluded by asking the respondent his full name, address, and telephone number so that he could be

contacted periodically during the 12-month monitoring period to ascertain the status of the residence and detectors.

During the monitoring period three rounds of panel maintenance were conducted at about three month intervals. During each round an attempt was made to contact every member of the panel. The initial attempt was by mail. If no response was received from the postcard then telephone calls were used to follow up.

Retrieval of the detectors began about 12 months after they were placed. Because the placement was staggered over four months, retrieval was similarly staggered. Occupants were mailed return packets that included a brief questionnaire, instructions on retrieving and packing the detectors, and a postage-paid return box.

## 2.5 PANEL MAINTENANCE AND DETECTOR RETRIEVAL

During the 12 month monitoring period members of the panel were contacted at about 3-month intervals to confirm that they were still participating in the study. During the first round of panel maintenance some residences were identified as having some lost or damaged detectors. These detectors were replaced by mail. This replacement procedure was mainly to reinforce the importance of the detectors upon the occupants and to encourage them to protect their remaining original detectors. The replacement of some of the detectors in an HU affected the length of the exposure period and compromised the validity of the 12-month average in some cases.

During the three rounds of panel maintenance 699 HUs whose occupants moved within nine months were identified, thus becoming ineligible. A total of 6,419 HUs were eligible at the end of the study. Detectors were returned for about 6,000 HUs but not all could be used for the final statistical analyses of the data. The detectors for about 300 HUs were excluded for various reasons.

Most of the 300 cases were excluded because their exposure period lengths were not within one month of the 12-month target. In some cases the exposure period was less than 11 months because the detectors were replaced during the first round of panel maintenance. Others' exposure periods were greater than 13 months because the residents did not return their detectors promptly when requested. In some cases, the occupants did not return all of the detectors placed because they were lost or damaged after the first round of panel maintenance. About 5,700 HUs were considered final respondents and their data was used in the final statistical analysis.

Table 2-3 summarizes the results for the initial data collection, detector placement, panel maintenance, and detector retrieval. Because of the high return rate of nearly 89 percent, the final number of respondents, 5,694, greatly exceeded the target of 5,000 established during the design phase of the study. The final cumulative detector coverage rate of nearly 72 percent also greatly exceeded the design target of about 60 percent. With this substantially higher rate, the potential missing data biases of the survey were substantially reduced and more accurate estimates of the radon distribution and its characteristics produced.

Because not all HUs were eligible for the survey, the inference population of the NRRS is only a subset of the entire U.S. population of HUs. Over 11,000 HUs were identified in the sample but only about 75 percent were eligible at the time of initial data collection. Only about 90 percent of the 7,118 initial respondents remained eligible for the 12 month monitoring period. Hence, about 68 percent of the sample HUs were eligible for the NRRS.

Table 2-3  
Summary of Data Collection Results

<u>Result Category</u>	<u>Number</u>	<u>Rates</u>
Total Sample Size	11,423	
Eligibility Status Ascertained	10,961	96.0%
Eligible Cases	8,344	
Nonrespondents	1,326	
Respondents	7,118	84.3%
Eligibility for Panel Maintenance Became Ineligible During Monitoring Period	7,118 699	
Eligible at end of Monitoring Period	6,419	
Final Nonrespondents	725	
Final Respondents	5,694	88.7%
Cumulative Detector Coverage Rate at End of Study (0.960 x 0.843 x 88.7%)		71.8%

### 3.0 Estimation Using Survey Results

#### 3.1 CALCULATION OF SAMPLING WEIGHTS

To generate unbiased population estimates from the sample data, it is necessary to use sampling weights to adjust for the unequal probabilities of selection of sample housing units. A sampling weight is equivalent to the number of cases in the population that the sample case represents.

A sampling weight equal to the inverse of the sample inclusion probability was calculated for each of the 11,254 sample line numbers. The sampling weight was computed as the inverse of the product of three probabilities:

- $p(1)$  = the probability of selecting the PSU
- $p(2|1)$  = the conditional probability of selecting the SSU, given the selection of the PSU in which it was located
- $p(3|2)$  = the conditional probability of selecting the line number, given the selection of the SSU in which it was located.

Therefore, the sample weight =  $1/(p(1)p(2|1)p(3|2))$ .

Because of nonresponse, however, using the unadjusted sampling weights may result in biased estimates of population totals. The sampling weight adjustments performed to compensate for nonresponse are described in the next section.

### 3.2 WEIGHT ADJUSTMENTS TO COMPENSATE FOR NONRESPONSE

As illustrated in Table 2-3, nonresponse occurred at three steps in the survey:

1. During the initial screening phase to ascertain the eligibility of the sample HUs.
2. During the interview and detector placement phase.
3. During panel maintenance and detector retrieval.

The final analysis weights were calculated by a series of weight adjustments corresponding to the three steps.

The adjustments for the first two steps were done similarly using weighting classes defined using the 22 design strata. In the first step, the sampling weights were ratio-adjusted within each design stratum. The adjustment factor was calculated as the ratio of the sum of the sampling weights to the sum of the sampling weights over the 10,961 cases for which their eligibility was ascertained. The 462 cases of unknown eligibility were assigned a weight of zero and dropped from the data file.

The second step ratio-adjusted the weights calculated in step one to compensate for the 1,326 eligible cases that did not cooperate. This adjustment guaranteed that the sum of the step two weights for the 7,118 responding HUs equaled the sum of the step one weights for the 8,444 eligible HUs. The 1,326 nonresponding eligible cases were assigned weights of zero and dropped from the data file.

The third step adjustment was identical in principle to the first two but used different weighting classes defined using responses to the questionnaire, and EPAs preliminary radon potential categories. The step three weighting classes were defined by forming two categories of radon potential (low and medium, or high), single- versus multi-family

units, and whether the single-family units had basements or the multi-family units had lowest levels with walls below ground. Within each of these weighting classes, the step two weights were adjusted so that the sum of the final analysis weights for the 5,694 final respondents equaled the sum of the step two weights for the 6,419 cases eligible at the end of the study. The 725 final nonresponding HUs were assigned zero for weights and dropped from the data file.

The sum of the final adjusted weights for the final 5,694 HUs is 64.6 million. Hence, about 69 percent of the approximately 93 million households in the U.S. were eligible for the NRRS during the 12 month monitoring period.

### **3.3 IMPUTATION OF MISSING RADON MEASUREMENTS IN FINAL RESPONDING HOUSING UNITS**

About 130 (2.3 percent) final responding HUs were missing a radon measurement for one of their levels. Values were imputed for the missing levels using regression equations calibrated on the cases with complete data. Five separate regressions were run and all included HU characteristics such as whether the residence was a single- or multi-family unit and whether level 1 was a basement or had walls below ground. The five regressions were as follows:

- Predicting a level 1 radon value as a function of the level 2 and HU characteristics -- using 2 level residences only
- Predicting a level 2 radon value as a function of the level 1 and HU characteristics -- using 2 level residences only
- Predicting a level 1 radon value as a function of the levels 2, 3, and HU characteristics -- using residences with more than 2 levels
- Predicting a level 2 radon value as a function of the levels 1, 3, and HU characteristics -- using residences with more than 2 levels

- Predicting a level 3 radon value as a function of the levels 1, 2, and HU characteristics -- using residences with more than 2 levels.

Three HUs had a missing radon measurement on their fourth level. For these cases, the radon measurement for level 3 was used as the imputed value.

### 3.4 DEFINITION OF RADON PARAMETERS

The detector placement protocol required that at least one alpha-track detector be placed on each living level of the residence up to four levels and that a detector be placed in the basement even if was not used as living space. If the residence had only one level, then two detectors were placed on that level. In a random subsample of the eligible HUs, collocated or duplicate detectors were placed. The protocol resulted in a range of two to eight detectors being placed in a residence, raising the issue, "How should the multiple radon measurements be summarized for the statistical analysis of the data?"

This issue was resolved by first calculating one radon measurement for each level in the residence by using the arithmetic mean of all the measurements on a level. Using the measurements by level, four summary parameters were calculated for each HU:

- Radon Concentration in the Lowest Level of Living Space
- Radon Concentration in the Lowest Level of Nonliving Space
- Average Radon Concentration Over All Levels Used as Living Space
- Weighted Average of the Radon Concentration Over All Levels.

As part of the data editing process, comparing the amount of time the occupants spent on different levels of their residences and whether they considered the levels living space revealed that different respondents had different perceptions of "living space." To



standardize the definition of living space across households, a "Standardized Living Space Flag" was defined for every level in every residence. The flag was defined as a function of both the average amount of time the household spent per day on a level and whether the occupants considered the level living space or not. The definition classified a basement as living space if the household averaged at least one hour per day in the basement or the occupants considered the basement living space. If the household spent any time in a nonbasement level it was classified as living space.

The standardized definition of living space was used to define the first three parameters. Because most occupants used every level of their residence as living space, only about 1,400 HUs contained a lowest level of nonliving space. The first and third parameters were defined for all 5,694 final respondents.

The fourth parameter was defined on a person level. Of the nearly 16,000 occupants residing in the final responding HUs, a weighted average radon concentration was calculated for each. The radon concentrations for every level of a residence were averaged using the proportion of time that the occupant spent on each level during an average day. For a low percent of the cases the occupants' time by level was not complete. In the cases where partial data was available it was used to estimate the average day. For the cases with no data, equal weights were assigned for each level.



## 4.0 Household Level File

The household level files include 331 variables for the 5,694 final respondents. The files contain all variables needed to duplicate any analysis or table for Volumes 1, 2, or 3 of the NRRS Statistical Analysis Report. (Note that SUDAAN or other appropriate statistical analysis software should be used to reproduce the standard errors shown in the tables.) The codebook for the ASCII version is contained in Appendix B. The codebook lists the 331 variables in the order they appear on the ASCII file, the position of each variable, a description, and the formats where applicable.

The household level files contain four types of variables:

- Design Variables
- Radon Measurement Variables
- Questionnaire Data and Analysis Variables
- Flags.

### 4.1 DESIGN VARIABLES

The design variables included such variables as PARTID (a household ID), the analysis weight (WT\_NRDAD), the strata (VARSTRAT and REGSTRAT), the primary sampling unit identifier (PSUID), and the secondary sampling unit identifier (SSUID). The PARTID was the unique identifier for each housing unit, and was used to merge data from the person level file and the household level file. Because the PSUs were nested with VARSTRAT, PSUID and VARSTRAT, along with the analysis weight, were necessary in analysis programs to attain the appropriate estimates and standard errors. The REGSTRAT was the design strata, and although not used in the analyses, it was retained for general knowledge and possible future use. Like REGSTRAT, SSUID was not directly used in any analysis but was retained to show how the sample was clustered.

## 4.2 RADON MEASUREMENT VARIABLES

The radon measurement variables included the following:

- Radon measurement from the lowest living level (PCLYLOLV)
- Radon measurement from the lowest non-living level (PCLYLNLV)
- Mean radon measurement overall living levels (PCLYHHMN)
- Radon measurement in the lowest level (LL\_PCLY).

The units of all radon measurements was pCi/L -yr.

Also included in this group were variations of the above variables. The variations included recoded versions, categorized versions, and the logs of the recoded values. A flag for lowest level not living space was provided as well. The categorized values were used to condense the radon values into a concise interpretable table. The recoded versions replaced a non-positive value or a zero with the value of 1/10,000 in order to calculate the logs because the log of a negative number is undefined. Therefore, these values were replaced with a "very small" number for analysis purposes. Even though the true radon concentration in a house cannot be less than zero, the measured concentration can be because of background corrections.

## 4.3 QUESTIONNAIRE DATA AND ANALYSIS VARIABLES

The majority of variables on the file were responses to actual questionnaire items, or variables created from the items. A small group of variables have been recoded, and of the recoded variables, less than one percent of the values were actually altered. These changes were due to inconsistencies with other responses of the questionnaire and other

households with like characteristics. The variables that were recoded have "flag" variables to indicate which values have been changed.

Some variables were created from the questionnaire variables for analysis purposes. Due to the nature of the software and for reporting purposes, some responses were grouped, or converted into simple "Yes/No" formats, or questionnaire items were combined. For example, the variable GRND\_CN (Is the housing unit a ground contact unit?) was created from questionnaire items 1 and 5. If the housing unit was not an upper-floor apartment or an unskirted mobile home, the unit was considered ground contact. Note that some upper-floor apartments excluded from the ground contact population had basement radon measurements associated with them. These, however, had a least one apartment between them and the basement.

The variables for Volume 1 of the NRRS Final Report were primarily the radon measurement variables. The design variables and population variables (testing population, ground contact population, and single-family/multi units) were also used.

The variables used for Volume 2 were mainly the questionnaire item variables and flags created for analysis purposes. Although easily replicated, the flags were retained for the convenience of the user to easily duplicate tables in Volume 2. The user may need to categorize certain variables to duplicate the tables exactly. Some variables remain in their original state and were only grouped into Volume 2 for simpler tables.

Variables for Volume 3 were created from questionnaire items. These variables were simpler forms of some of the questionnaire data and were needed in order to perform the relational analyses with the software used. Also for the relational analysis, linear, quadratic, and cubic components were created in some cases using orthogonal contrasts. Squared terms of variables were also created. In addition to creating new variables, some additional editing was done to variables after Volume 2 was created to eliminate inconsistencies.

#### 4.4 FLAGS

Several types of flags exist on the household level file. One type is the recoding indicators. These flags begin with "FLAG" or "FLG" and indicate which values of the variables were "recoded". The recoding was done to eliminate missing values and inconsistencies among different questions. For example, if the response to question 1 (What type of residence?) was "Single Unit, Detached Dwelling" but the next question was blank (What type of single-family dwelling?) and the number of units in the building was more than one, and other multi-unit building specific questionnaire items were answered, then question 1 was "recoded" to "Multi-Unit Building."

Computer programs were written to identify the cases with one or more missing items or inconsistent responses. The entire questionnaire data record was examined to ascertain the best resolution of the inconsistencies or to make an educated imputation for the missing items. The number of radon measurements, their relative values, and placement order were also used.

The number of missing values that needed imputing were no more than 0.6 percent for any one question. The number of recoded values was never more than one percent except for two items: whether the residence had a basement and the number of levels in the residence. About 1.3 percent of the basement answers were recoded, mainly because some respondents had their lowest levels with walls partially below ground but did not consider their lowest level to be a basement. About 1.3 percent of the number of levels in the home were recorded. These records primarily were the result of two misunderstandings by the respondents. One was from respondents living in small multi-unit buildings such as duplexes. These respondents gave the number of levels in the buildings, not in their residences. The other was from respondents who did not use their basements as living space and therefore did not include the basements as one of the levels in their residences.

Another type of flag was created for analysis or table generation. Some questionnaire items were involved in a skip pattern. These flags were created to cross with variables in a skip pattern to eliminate invalid responses. Note that some questions were answered that should not have been, but these responses remain in the data. Therefore, when producing a table or replicating an NRRS Report table, variables involved in a skip pattern were crossed with the primary branch question in order to attain only the legitimate responses.

For example, question 1 (R\_RES3) should have been and was answered by all respondents, But if the response was "A mobile home" or "A multi-unit building" then question 2 (R\_TYPE) should have been skipped. Only those responding "A single unit, detached dwelling" should have answered question 2. However, some respondents did not properly skip question 2. Therefore, when producing a table for question 2, the variable was crossed with question 1, or the equivalent flag (Q1SFLAG). This flag had a value of "1" if the response to question 1 is for a single-family unit. Then the legitimate answers were flagged, and the others were ignored.

The last type of flag was the population flags. These were "1-2" variables ("Yes/No") that group the households into certain categories. For example, if a housing unit was an upper floor apartment, then the value of the variable UPPERFL was "1". Other similar variables were GRND\_CN, TEST\_POP, and SINGMULT. These variables were used in generating tables for subsetting the population.

#### 4.5 CODEBOOK FOR ASCII VERSION

The codebook for the ASCII version of the NRRS database is contained in Appendix B and lists all 331 variables in the database in the order they were used in the three volumes of the NRRS Statistical Analysis Report. The variables listed, starting with EPAREG and ending with GRND\_CN on the second page, were used in tables and analyses for Volume 1. The next variables from SINGMULT (page 2) to HOWREDUC

(page 41) were used in Volume 2. These variables are all the questionnaire variables and are ordered by question number. The remaining variables consist of variables used in Volume 3 analyses and the recoding "flag" variables. The Volume 3 variables are listed in alphabetical order, with the "flag" variables listed last in alphabetical order.

The codebook contains the variable label (name), the beginning and ending columns, the character length, the type, and the variable description. The codebook also lists the values of the discrete variables and the labels associated with the values.

The beginning and ending columns direct the user to where the variable is located, and the length is the actual maximum number of characters in the value for the variable. For example, the first variable on the file, EPAREG, starts at column 1 and ends at column 2 and the maximum value contains 2 characters. EPAREG has values ranging from "01" to "10". Because EPAREG is self-explanatory, it has no format listing in the codebook.

The values for the type (fifth column) can be "N"(numeric) or "A" (alphanumeric). Some numeric variables contain decimals, and the number of decimal places can be found in the "Type" column accompanying the "N". For instance, the variable PCLYLOLV on the first page has a type value of "N6". The values for this variable are numeric with six places to the right of the decimal ("12.345678" for example). If the "N" stands alone in the "Type" column, then the variable value is an integer.



## 5.0 Overview of the Questionnaire

### 5.1 COMMENTS ON THE INFERENCE POPULATION OF THE QUESTIONNAIRE DATA

The housing units included in the NRRS were selected using scientifically valid methods that permit statistically valid inferences to a large percentage of all housing units in the U.S. The NRRS sample design employed complex features such as stratification, stages of selection, and unequal probabilities of selection to control the sample size by EPA Region and to improve the efficiency of the design.

Nearly every housing unit in the U.S. had a chance of being included in the NRRS sample. Not all housing units, however, were eligible for inclusion in the study. The exclusion of some housing units from the study population limits inferences, based solely on statistical principles, to only those housing units in the U.S. that were eligible. The definition of an eligible housing unit and the fraction of all U.S. housing units that were eligible were discussed in Chapter 2.

This definition excluded about 22 percent of the housing units in the sample. About half were vacant or vacation homes and half were cases where the occupants had firm plans to move.

Inferences to populations that were not eligible for the NRRS can be made, but not solely on statistical principles. Assumptions, and judgement about their validity, must be used to make inferences to housing units not eligible for the NRRS.

## 5.2 DATA OBJECTIVES

One of the objectives of the NRRS was to identify and evaluate relationships among the radon concentrations and housing unit characteristics. The characteristics of interest included construction characteristics such as:

- General characteristics such as single or multi-family structures and the age of the structure
- Foundation characteristics such as basement, slab-on-grade, or crawl space
- Number of levels in the housing-units and their use as living or nonliving space
- Existence and location of a garage or other features attached to the foundation.

Also of interest were heating, ventilation, and air conditioning (HVAC) characteristics such as:

- Main heating distribution system and fuel;
- Supplementary heating systems;
- Air conditioning;
- Powered air exhaust systems;
- Thermostat settings;
- Weather-proofing and insulation;
- Passive ventilation.

The questionnaire was designed to capture data on these characteristics.

The questionnaire also collected data on the occupants to provide information useful to EPA's risk assessment. The data included the occupants' ages, genders, smoking habits, and their occupancy patterns. The occupancy patterns were quantified by asking how much time each person spent in the residence on an average weekday and weekend-day and how the time was distributed by level of the residence.

The occupants were also asked if the residence had ever been tested for radon, how many times, the results of the test, and if any mitigation had been done. These questions were asked to give information on the frequency of testing and mitigation.

### 5.3 DESIGN AND FORMAT

The questionnaire was developed to capture the data necessary to satisfy the objectives of the study through a sequence of laboratory experiments and pretesting. First, a series of experiments were designed to test terminology, question wording, and ordering, to develop a draft questionnaire. The draft questionnaire was pretested on small groups and revised to develop the final draft questionnaire. The final draft questionnaire was pretested on about 60 cases, purposely chosen to represent a range of housing characteristics and socioeconomic groups. The experiences of the pretest were used to revise the questionnaire into its final form. Appendix C contains a copy of the final questionnaire used in the NRRS.

The NRRS questionnaire is complex. The complexity of the questionnaire arises from the many different housing unit characteristics that were to be captured and the fact that many housing units exhibited only some of the characteristics while others exhibited many.

The 77 questions solicited 87 potential responses because some questions had more than one part. Only 43 of these questions were required to be asked of all housing units. A complex system of skip patterns was used to avoid asking respondents questions not applicable to their residences. The skip patterns increased the complexity of the questionnaire administration but minimized the respondent burden and prevented annoying respondents by asking them nonsensical questions. Both of these aspects generally improve the cooperation rate for surveys.

Fourteen questions were "primary branch questions" that were asked of all participants. Associated with each primary branch question was a set of questions that were asked or skipped depending on the response to the branch question. For example, question 7 asked if the residence contained a basement. If it did not, questions 8 through 11 were skipped. A total of 46 questions were contained in the primary skip patterns.

Another 10 questions were "secondary branch questions". These questions were nested inside a primary skip pattern. For example, question 8 asked if the basement can be entered from inside the residence. If not, question 9 was skipped. A total of 16 questions were contained in the secondary patterns.

Another dimension that added to the complexity of the questionnaire was some questions did not have unique answers, necessitating "multiple response" questions. For example, question 10 asked of what materials were the basement walls constructed. Some basements had walls that were constructed of more than one material.

Table 5-1 illustrates the features of the questionnaire design discussed above. The questions are listed by their question numbers, grouped into four major categories:

- Construction Characteristics;
- HVAC Characteristics;
- Occupant Characteristics;
- Concluding Questions.

The construction characteristics are partitioned into two groups: foundation and other. Within each major category the questions are further grouped by their topic.

The third through sixth columns of the exhibit indicate with a "1" whether the questions were answered by all, in a primary skip, in a secondary skip, or permitted multiple responses. The last column gives an abbreviated branch instruction for the primary and secondary branch questions.

Table 5-1

Questionnaire Design: Question Category, Skip Patterns,  
and Multiple Responses. Page 1 of 5

Question Category	Question Number	Answered by All	In a Primary Skip	In a Secondary Skip	Multiple Responses	Branch Instructions
CONSTRUCTION CHARACTERISTICS						
Residence Type and Age	1	1				If mobile home, go to 6 If multi-unit, go to 3 Go to 6
	2		1			
	3		1	1		
	4		1	1		
	5		1	1		
	6	1				
Foundation Characteristics						
Basement	7	1				If no basement, go to 12 If no basement entrance, go to 10
	8		1			
	9		1	1		
	10		1		1	
	11		1			
Slab-on-Grade	12	1				
Crawl Space	13	1				If no crawl space, go to 20 If no exposed earth, go to 15
	14		1			
	14a		1	1		
	15		1			If crawl not enclosed, go to 20
	16		1	1	1	
	17		1	1		If no vents, go to 20
	18		1	1		
	19		1	1		

Table 5-1

Questionnaire Design: Question Category, Skip Patterns,  
and Multiple Responses. Page 2 of 5

Question Category	Question Number	Answered by All	In a Primary Skip	In a Secondary Skip	Multiple Responses	Branch Instructions
Open Air	20	1				
Percent by Foundation Categories	21	1			1	
Other Construction Characteristics						
Levels of Residence	22	1				
	23	1			1	
	24	1			1	
Primary Radon Barrier	25	1			1	
Garage	26	1				If no garage, go to 29
	27		1			
	28		1			
Other Attached Features	29	1				If nothing attached, go to 31
	30		1		1	
HEATING, VENTILATION, AND AIR CONDITIONING CHARACTERISTICS						
Main Heating System	31	1				If no main heat, go to 37
	32		1			
	33a		1		1	If no, go to 34
	33b		1	1	1	
	34		1			If not forced air, go to 37
	35		1	1		
	36		1	1		

Table 5-1

Questionnaire Design: Question Category, Skip Patterns,  
and Multiple Responses. Page 3 of 5

Question Category	Question Number	Answered by All	In a Primary Skip	In a Secondary Skip	Multiple Responses	Branch Instructions
Supplementary Heating	37	1				If no sup heat, go to 43a
	38		1		1	
	39a		1		1	If no, go to 40
	39b		1	1	1	
	40		1		1	If not forced air, go to 43a
	41		1	1		
	42		1	1		
Fireplace	43a	1				If no fireplace, go to 44a
	43b		1		1	
	43c		1			
Humidifying Devices and Usage	44a	1			1	If no, go to 45
	44b		1			
Air-To-Air Heat Exchanger	45	1				
Average Winter Temperature	46	1				
Gas or Propane Appliances	47	1			1	
Air Conditioning	48	1				If yes, fill in 50a
	49a	1				
	50a		1			If yes, fill in 50a
	49b	1				
	50b		1			
Average Summer Temperature	51	1				

Table 5-1

Questionnaire Design: Question Category, Skip Patterns,  
and Multiple Responses. Page 4 of 5

Question Category	Question Number	Answered by All	In a Primary Skip	In a Secondary Skip	Multiple Responses	Branch Instructions
Powered Exhaust Systems and Usage	52a	1			1	If no, go to 53
	52b		1			
	53	1				If no exhaust fans, go to 54a
	53a		1			
	53b		1			
Weather Proofing and Insulation	54a	1			1	If no, go to 55
	54b		1			
	55	1				
Passive Ventilation	56	1			1	
	57	1			1	
	58	1				
-----						
OCCUPANT QUESTIONS						
-----						
Demographics	59	1				
	60	1				
	61	1				
	62	1				
-----						
Length Resided	63	1				
-----						
Smoking Characteristics	64	1				If nonsmoker, go to 68
	65		1			
	66		1			
	67		1			
-----						
Occupancy Patterns	68	1				
	69	1				
	70	1				
	71	1				
-----						



Table 5-1

Questionnaire Design: Question Category, Skip Patterns,  
and Multiple Responses. Page 5 of 5

Question Category	Question Number	Answered by All	In a Primary Skip	In a Secondary Skip	Multiple Responses	Branch Instructions
<b>CONCLUDING QUESTIONS</b>						
Owner or Renter	72	1				
Previous Radon Testing, Results, and Mitigation	73	1				If not tested, go to page 23, detector placement
	74		1			
	75		1			
	76		1			If not tried reduced radon, go to page 23
	77		1	1		
Column totals	87	43	46	16	20	

#### 5.4 QUESTIONNAIRE ADMINISTRATION

Because of the complexity of the questionnaire and the fact that the alpha-track radon detectors needed to be carefully placed using uniform protocols, every household in the sample was visited by the field staff. Prior to data collection, the field staff were thoroughly trained and tested in the proper administration of the questionnaire, detector placement, and all other survey protocols and procedures. The field staff were also provided with illustrations of examples of types of housing unit construction types and HVAC appliances to assist the occupant in understanding the terminology of the questionnaire thus enhancing the accuracy of the data they provided.

#### 5.5 DATA EDITING AND RECODING

Every questionnaire was manually edited prior to being keyed. The main purpose of the manual edits was to ascertain if a selected subset of key questions was answered. If key questions had missing data then attempts were made to recontact the respondents by phone to fill in the missing data.

During the editing some additional coding of the responses was done. In multiple choice questions, such as 10, a list of anticipated responses was precoded to facilitate the question administration, data entry, and statistical analysis. However, it is also sound questionnaire design to include an "other-specify" category, to capture unanticipated or uncommon responses. During the manual editing of the questionnaires, the "other-specify" responses were reviewed and classified into one of the precoded categories or assigned a new code prior to data entry.

After the questionnaires were keyed, computer programs were written to further edit the data. The computer edits checked for completeness of the key questions and adherence to the skip patterns. During these edits, blank responses were coded to distinguish

between truly missing data and responses that should have been blank because the question was not applicable to the housing units.

Additional extensive editing on a subset of the key questions was done. The subset was those questions that were necessary to produce the estimates of the radon distribution given in Volume 1. Table 5-2 lists the questions by their numbers with brief descriptions of their contents that were extensively edited. Because of the importance of these questions, special editing was done. A small percentage of the responses to these questions were imputed or recoded.

Missing items were logically imputed based on responses to other questions. Inconsistent items were logically recoded to eliminate inconsistent responses within the same questionnaire.

## 5.6 IMPACT OF THE QUESTIONNAIRE DESIGN ON STATISTICAL ANALYSIS

The maximum number of observations for the statistical analyses of the questionnaire data is 5,694, the number of final respondents. The 41 questions that should have been answered by all respondents have, at most, this number of observations. Because of item nonresponse, however, many items contain a "missing" category that includes refusals, don't knows, and otherwise missing or bad data. In general, the percent "missing" is small.

Because of the skip patterns, some questions were not asked of every respondent. Every question contained in a skip pattern was analyzed based on the response to the appropriate branch question(s). The main consequence of this approach based on less than the maximum number of observations. For example, Question 2 was applicable only to occupants of single-family residences. Questions 3, 4, and 5 were applicable only

to occupants of multi-unit buildings. Questions 2, 3, 4, and 5 were not applicable to occupants of mobile homes.

Analysis of the multiple response questions was complicated by the fact that one respondent may exhibit more than one characteristic. Each response category, therefore, needed to be estimated separately. The main consequence of this approach was that the sum of the percentages over all possible responses may be greater than 100 because of multiple counting of housing units exhibiting more than one characteristic.

Table 5-2  
List of Extensively Edited Key Questions

<u>Question Number</u>	<u>Brief Description</u>
1	Residence Code – multi-unit building, mobile home, detached single-family unit.
2	Residence Type – Defined only for single-family units – one story, split-level, split-foyer, two story, three story.
7	If the residence had a basement – yes or no.
22	Number of levels in the residence – 1, 2, ...6.
23	Which levels in the residence had walls partially or completely below ground.
24	Which levels of the residence were used as living space.
68-71	The amount of time each occupant spent on the levels of the residence by weekday and weekend-day.

## **APPENDIX A**

### **Installation Procedures**



## Installation Procedures

### 1. EXTRACTING DATA FROM THE DISKETTE

The two diskettes you have received have three files:

- **DATA.FIL** - a compressed version of the radon measurement data collected in the EPA National Residential Radon Survey. Disk 1 contains data for EPA Regions 1 through 4. Data for Regions 5 through 10 are on disk 2.
- **EXTRACT.EXE** - an executable program to extract and store the expanded version of the survey data file on your hard disk. The extract program will run on any IBM-compatible personal computer using the MS-DOS operating system, Version 2.0 or higher.
- **READ\_ME.1ST** - a copy of these instructions.

To expand the compressed file onto your hard disk, place the diskette in the appropriate drive and change to this drive. (For example, type **A:** then press the Enter key.) Run the program by typing the command **EXTRACT**, then press the Enter key. The program will ask where you want to store the expanded file. Respond by entering a full DOS pathname and filename to specify the drive, directory and name for the expanded file. For example, you may enter **C:\SURVEY\FILE1.DAT**. Note that the directory to which the file will be written (**C:\SURVEY**) must already exist on your hard disk. If the file (**FILE1.DAT**) already exists on the directory, you will be asked if you want to overwrite the file. Enter **Y** or **N**, as appropriate. The expanded file will be created under the filename and directory specified.

You will be asked to choose the length of the extracted records. The basic set of information concerning the radon measurements is contained in the first 126 characters on each record; the questionnaire data is contained in positions 127 to 623; and the analysis variables and flags are in positions 624 to 778. Enter a positive integer less than

or equal to 778 to select the length. Or, enter 0 to extract the entire record. (See Chapter 4 of the documentation for a discussion of the three sets of information contained on each record. Spreadsheet users should also read the length considerations noted below before deciding on a record length.)

The program will ask if you want to select specific EPA Region codes to extract from the survey data file. (Note: Read the file size considerations noted below before deciding how to extract the data.) To extract all of the data in the file, enter A. Enter S to extract only a subset of the data, rather than the entire file. You may select region codes from the list as instructed by the program. Note that the codes must be entered exactly as listed. After selecting the regions, enter A to extract the file. If you make a mistake, enter B to re-enter the list of codes. You may enter C at any time to see the list of codes again, or Q to exit the program.

## 2. SIZE CONSIDERATIONS

The entire expanded file for each diskette requires over 2 Megabytes of disk space. The expanded file is a standard DOS text file, with fixed-length records, one record for each house returning useable measurements. The expanded data file contains at most 778 ASCII text characters on each record, followed by carriage return and linefeed characters at the end of each line of text. A description of the layout of information on each record is included in the documentation for this diskette as Appendix B. The variable names listed there are the names used in EPA's analysis of the survey data.

The expanded file may be imported into a variety of DOS application programs for display and/or analysis. Most DOS applications can import DOS text files. Analysis of the data will require the use of an application program and a computer with sufficient memory available to handle a file of the required size. This should be considered when the Extract program is run. If data for all regions on the disk are extracted into a single expanded file and your computer does not have additional extended or expanded



memory beyond the now standard 640 Kilobytes of DOS memory, the large size of the expanded file may cause problems in many applications. If file size problems are a concern for your program or computer, we recommend extracting the data for each region into a separate file. The resulting expanded files for each region will be much smaller and problems due to size alone will be avoided.

Another consideration is the length of the records in the expanded file. Many spreadsheet programs have a limit of approximately 250 to 500 characters per line of text. The full expanded file contains records with 778 characters and an error will occur when importing the text file into most versions of Lotus 123, for example, although sufficient memory may be available. Excel for Windows will truncate the records with no error message. To import the data into a spreadsheet program, select the appropriate record length for your program. Other more flexible types of software must be used to analyze the entire record. Database applications, such as DBase and Paradox, or statistical analysis packages, such as SAS or SPSS, include group data handling procedures. Use of software of this type is recommended for analysis of the entire 331 variable data set.

### 3. ACCESSING DATA IN THE EXPANDED FILE

The expanded file is sorted by states within regions, so that all records for a given state are grouped together in the file. For users without access to more powerful software, selected portions of the data may be viewed and printed using any word processing program that accepts DOS text files as input. For example, in version 5.0 of Wordperfect this is accomplished by the [Control-F5, 1, 2] keystroke sequence. Select a very small font and use the landscape page orientation to view and print as many columns of data as possible.

To conserve disk space, the expanded file does not include blank spaces between adjacent entries on a record, so a simple printout of the file as received may difficult to

read. It is also difficult to analyze the data using a word processing program. DOS spreadsheet, database and statistical application programs may be used to reformat, graph and/or analyze the data.

The expanded file may be imported into a Lotus 123 spreadsheet, for example, using the [/File, Import, Text] keystroke sequence, if sufficient memory is available and the text line length limitation noted above is met. The specific variables on each record may be parsed into individual numeric and label cells using the [/Data, Parse, Format, Create] keystroke sequence to specify the columns with the desired information. Then set the Input and Output ranges from the data parse menu, followed by Go. Other spreadsheet and database packages have specific procedures for importing DOS text file specified in the user reference manual.

#### 4. CONSIDERATIONS FOR DATA ANALYSIS

This file reports four types of annual average radon measurements, conducted in accordance with prevailing EPA protocols in effect in the year of the survey. See Section 4.2 of the documentation for a definition of the four types of averages. The file contains one record for each surveyed home with a useable radon measurement collected during the survey. Some data fields may have missing entries on certain records. Although attempts were made to gather complete information on each useable radon test, it was not possible to complete all items for all surveyed homes. Codes for missing data items are indicated in the record layout in Appendix B of the documentation.

The radon concentrations were estimated using a laboratory counting procedure on the exposed alpha track detectors, with a correction made for counts due to background radiation. This correction results in negative estimates of the radon concentration in some homes. These negative numbers should be considered a result of measurement error. In reality, radon concentrations are always non-negative.

Note that radon measurements are reported in the database with six digits to the right of the decimal. The reported numbers are, in general, averages of more than one measurement. The original measurements contained much less precision. Although six digits were retained in the calculated averages, the actual precision is approximately the same magnitude as the original data. Values at or below 1.0 pCi/L have large percentage measurement errors. Values below approximately 0.5 pCi/L generally are considered to be below the lower limit of detection of the measurement procedure.



## **APPENDIX B**

### **CODEBOOK FOR ASCII VERSION**



National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
EPAREG	1	2	2	N	EPA REGION ID, = (1-10)
EPARPCAT	3	3	1	N	EPA radon potential category, 1-3
		1			= Low Radon Category
		2			= Medium Radon Category
		3			= High Radon Category
REGSTRAT	4	6	3	N	IDENTIFIER FOR 22 FIRST-STAGE STRATA
STABBR	7	8	2	A	STATE POSTAL ABBREVIATION
PCLYLOLV	9	17	9	N6	Lowest Level Living Space PCLY
PCLYLNLV	18	27	10	N6	Lowest Level None Living Space PCLY
PCLYHHMN	28	36	9	N6	Mean PCLY Over All Living Levels
LOLVNLIV	37	37	1	N	Lowest Level None Living Space
		1			= Low Level Not Living Space
		2			= Low Level Is Living Space
VARSTRAT	38	42	5	N	Variance Stratum
PSUID	43	45	3	N	FIRST-STAGE SAMPLE ID, =(1 TO 125)
WT_NROAD	46	63	18	N12	NR ADJ HU WT AT DR (ADJ_NRRDR*WT_NRSAD)
LOLVCAT	64	65	2	N	Lowest Level Living Space PCLY Cat.
		1			= PCLY Less than or Equal to 1
		2			= 1 < PCLY <= 2
		3			= 2 < PCLY <= 3
		4			= 3 < PCLY <= 4
		5			= 4 < PCLY <= 5
		6			= 5 < PCLY <= 6
		7			= 6 < PCLY <= 8
		8			= 8 < PCLY <= 10
		9			= 10 < PCLY <= 20
		10			= PCLY Greater than 20
LNLVCAT	66	67	2	N	Low. Lev. None Liv. Space PCLY Cat.
		1			= PCLY Less than or Equal to 1
		2			= 1 < PCLY <= 2
		3			= 2 < PCLY <= 3
		4			= 3 < PCLY <= 4
		5			= 4 < PCLY <= 5
		6			= 5 < PCLY <= 6
		7			= 6 < PCLY <= 8
		8			= 8 < PCLY <= 10
		9			= 10 < PCLY <= 20
		10			= PCLY Greater than 20

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
HHMNCAT	68	69	2	N	Mean PCLY Over All Living Levels, Categ. 1 = PCLY Less than or Equal to 1 2 = 1 < PCLY <= 2 3 = 2 < PCLY <= 3 4 = 3 < PCLY <= 4 5 = 4 < PCLY <= 5 6 = 5 < PCLY <= 6 7 = 6 < PCLY <= 8 8 = 8 < PCLY <= 10 9 = 10 < PCLY <= 20 10 = PCLY Greater than 20
HHMN	70	78	9	N6	Recoded Mean PCLY Over All Living Levels
HHMNLOG	79	87	9	N6	Log Rec. Mean PCLY Over All Living Level
LOLV	88	96	9	N6	Recoded Lowest Level Living Space PCLY
LOLVLOG	97	105	9	N6	Log Recoded Lowest Level Living PCLY
LNLV	106	115	10	N6	Recoded Low. Lev. None Liv. Space PCLY
LNLVLOG	116	124	9	N6	Log Recoded Low. Lev. None Liv. PCLY
TEST_POP	125	125	1	N	Testing population: 1 It tp, 2 ow 1 = Testing Population 2 = Not Testing Population
GRND_CN	126	126	1	N	Ground contact unit: 1 If gcu, 2 ow 1 = Ground Contact Unit 2 = Not Ground Contact Unit
SINGMULT	127	127	1	N	Q1: Is residence a single-family unit 1 = Yes 2 = No 77 = Legitimate Skip 94 = Don't Know 95 = Out-of-range Response 96 = Multiple Response 97 = Refusal 98 = Blank
R_RES3	128	128	1	N	Q1: Type of residence 1 = Multi-Unit Building 2 = Mobile Home 3 = Single Unit, Detached Dwelling
Q1MFLAG	129	129	1	N	Flag: 1 If R_RES3=1, 2 otherwise
Q1SFLAG	130	130	1	N	Flag: 1 If R_RES3=3, 2 otherwise



National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
R_TYPE	131	132	2	N	Q2: Type of single-family residence
		1			= Ranch Style or 1 Story
		2			= Split Level
		3			= Split Foyer
		4			= 2 Story
		5			= 3 or More Stories
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
NUMUNITS	133	136	4	N	3. HOW MANY HOUSING UNITS IN BUILDING
NUMFLORS	137	138	2	N	4. HOW MANY FLOORS ARE IN THIS BUILDING.
LOWFLOR	139	140	2	N	5. WHICH FLOOR IS LOWEST LEVEL OF HOME
BLDG_AGE	141	142	2	N	6. ABOUT HOW OLD IS THIS (HOME/BUILDING)
		1			= Less Than 1 Year Old
		2			= 1-5 Years Old
		3			= 6-10 Years Old
		4			= 11-20 Years Old
		5			= 21-40 Years Old
		6			= Over 40 Years Old
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
R_BASEMT	143	144	2	N	Q7: Does residence have basement
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q7FLAG	145	145	1	N	Flag: 1 if R_BASEMT=1, 2 otherwise
BASENTR	146	147	2	N	8. CAN YOU ENTER BASEMENT FROM INSIDE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
BASEDOOR	148	149	2	N	9. DOOR BETWEEN BASEMENT AND NEXT LEVEL
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
Q9FLAG	150	150	1	N	Flag: 1 if R_BASEMT=1 & BASENTR=1, 2 ow
OBWCBLK	151	152	2	N	10. MOST OF BASEMENT WALLS-CINDER BLOCK
		1 = Yes			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
OBWPOUR	153	154	2	N	10. MOST OF BASEMENT WALLS-POURED CONCRE
		2 = Yes			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
OBWSTONE	155	156	2	N	10. MOST OF BASEMENT WALLS-STONE/MORTAR
		3 = Yes			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
OBWWOOD	157	158	2	N	10. MOST OF BASEMENT WALLS-WOOD
		4 = Yes			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
OBWBRICK	159	160	2	N	10. MOST OF BASEMENT WALLS-BRICK/VENEER
		5 = Yes			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
OBWDIRT	161	162	2	N	10. MOST OF BASEMENT WALLS-EARTH/DIRT
		6 = Yes			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
OBWOTH	163	164	2	N	10. MOST OF BASEMENT WALLS-SOMETHING ELS
		7 = Yes			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
BASEARTH	165	166	2	N	11. ANY PART BASEMENT FLOOR EXPOSED EART
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
HOMESLAB	167	168	2	N	12. ANY PART OF HOME ON CONCRETE SLAB
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
Q12FLAG	169	169	1	N	Flag: 1 if HOMESLAB=1, 2 otherwise
CRAWLSPC	170	171	2	N	13. IS ANY PART OF HOME OVER CRAWL SPACE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q13FLAG	172	172	1	N	Flag: 1 if CRAWLSPC=1, 2 otherwise
CRLXPOSD	173	174	2	N	14. PART OF CRAWL SPACE HAVE EXPOSED EAR
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q14FLAG	175	175	1	N	Flag: 1 if CRAWLSPC=1 & CRLXPOSD=1, 2 ow
CRLSURFC	176	177	2	N	14a. WHAT COVERS SURFACE OF CRAWL SPACE
CRLNCLOS	178	179	2	N	15. HOW MUCH CRAWL SPACE ENCLOSED BY WAL
		1			= All
		2			= Part
		3			= None
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q15FLAG	180	180	1	N	Flag: 1 if CRAWLSPC=1 & CRLNCLOS=(1,2)
Q15	181	181	1	N	Flag: 1 if CRLNCLOS=1, 2 otherwise
OFCCBLK	182	183	2	N	16. FOUND./CRAWL SPACE WALLS-CONCRETE BL
		1			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
OFPOUR	184	185	2	N	16. FOUND./CRAWL SPACE WALLS-POURED CONC
		2			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
OFSTONE	186	187	2	N	16. FOUND./CRAWL SPACE WALLS-STONE/MORTA
		3			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
OFWOOD	188	189	2	N	16. FOUND./CRAWL SPACE WALLS-WOOD
		4			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
OFBRICK	190	191	2	N	16. FOUND./CRAWL SPACE WALLS-BRICK/VENE
		5			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
OFDIRT	192	193	2	N	16. FOUND./CRAWL SPACE WALLS-EARTH/DIRT
		6			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
OFOTHR	194	195	2	N	16. FOUND./CRAWL SPACE WALLS-SOMETHING E
		7			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
CRLNTR0S	196	197	2	N	17. ENTER CRAWL SPACE W/OUT GOING OUTSID
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
CRLVENTS	198	199	2	N	18. AIR VENTS IN FOUNDATION WALLS
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q18FLAG	200	200	1	N	Flag: 1 if Q15FLAG=1 & CRLVENTS=1, 2 ow
VENTSOPN	201	206	6	N2	19. PERCENTAGE OF TIME AIR VENTS OPEN
HOMECLS	207	208	2	N	20. IS ANY PART OF HOME OVER OPEN AIR
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q20FLAG	209	209	1	N	Flag: 1 if HOMECLS=1 & CRLNCLOS=3, 2 ow

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
BMENTCAT	210	211	2	N	Q21a: Percent of home over basement
		1 = 0%			
		2 = 1 to 20%			
		3 = 21 to 40%			
		4 = 41 to 60%			
		5 = 61 to 80%			
		6 = 81 to 99%			
		7 = 100%			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
SLABCAT	212	213	2	N	Q21b: Percent of home over concrete slab
		1 = 0%			
		2 = 1 to 20%			
		3 = 21 to 40%			
		4 = 41 to 60%			
		5 = 61 to 80%			
		6 = 81 to 99%			
		7 = 100%			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
CRWLCAT	214	215	2	N	Q21c: Percent of home over crawl space
		1 = 0%			
		2 = 1 to 20%			
		3 = 21 to 40%			
		4 = 41 to 60%			
		5 = 61 to 80%			
		6 = 81 to 99%			
		7 = 100%			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
OPENCAT	216	217	2	N	Q21d: Percent of home over open air
		1 = 0%			
		2 = 1 to 20%			
		3 = 21 to 40%			
		4 = 41 to 60%			
		5 = 61 to 80%			
		6 = 81 to 99%			
		7 = 100%			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
OTHRCAT	218	219	2	N	Q21e: Percent of home over something els
		1 = 0%			
		2 = 1 to 20%			
		3 = 21 to 40%			
		4 = 41 to 60%			
		5 = 61 to 80%			
		6 = 81 to 99%			
		7 = 100%			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
R_HOMLEV	220	220	1	N	Q22: Number of levels or floors in home
		1 = 1 Level in Household			
		2 = 2 Levels in Household			
		3 = 3 Levels in Household			
		4 = 4 Levels in Household			
		5 = 5 Levels in Household			
		6 = 6 Levels in Household			
R_LEV1BL	221	222	2	N	Q23: Level 1 partly or all below ground
		1 = Yes			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			



National Residential Radon Survey  
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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
R_LEV2BL	223	224	2	N	Q23: Level 2 partly or all below ground
		2			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
R_LEV3BL	225	226	2	N	Q23: Level 3 partly or all below ground
		3			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
R_LEV4BL	227	228	2	N	Q23: Level 4 partly or all below ground
		4			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
R_LEV5BL	229	230	2	N	Q23: Level 5 partly or all below ground
		5			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
R_LEV6BL	231	232	2	N	Q23: Level 6 partly or all below ground
		6			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
LEV1_LIV	233	234	2	N	24. LEVEL ONE USED AS LIVING QUARTERS
		1 = Yes			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
LEV2_LIV	235	238	2	N	24. LEVEL TWO USED AS LIVING QUARTERS
		2 = Yes			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
LEV3_LIV	237	238	2	N	24. LEVEL THREE USED AS LIVING QUARTERS
		3 = Yes			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
LEV4_LIV	239	240	2	N	24. LEVEL FOUR USED AS LIVING QUARTERS
		4 = Yes			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
LEV5_LIV	241	242	2	N	24. LEVEL FIVE USED AS LIVING QUARTERS
		5 = Yes			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
LEV6_LIV	243	244	2	N	24. LEVEL SIX USED AS LIVING QUARTERS
		6			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
SLS_FLG1	245	245	1	N	Q24: Standardized living space flag lev1
		1			= Level 1 Living Space
		2			= Lev 1 Not Living Space
SLS_FLG2	246	246	1	N	Q24: Standardized living space flag lev2
		1			= Level 2 Living Space
		2			= Lev 2 Not Living Space
SLS_FLG3	247	247	1	N	Q24: Standardized living space flag lev3
		1			= Level 3 Living Space
		2			= Lev 3 Not Living Space
SLS_FLG4	248	248	1	N	Q24: Standardized living space flag lev4
		1			= Level 4 Living Space
		2			= Lev 4 Not Living Space
SLS_FLG5	249	249	1	N	Q24: Standardized living space flag lev5
		1			= Level 5 Living Space
		2			= Lev 5 Not Living Space
SLS_FLG6	250	250	1	N	Q24: Standardized living space flag lev6
		1			= Level 6 Living Space
		2			= Lev 6 Not Living Space
LOFLRPC	251	252	2	N	25. LOWEST LEVEL 'FLOOR'-POURED CONCRETE
		1			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
LOFLRWD	253	254	2	N	25. LOWEST LEVEL 'FLOOR' - WOOD
		2			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
LOFLRERT	255	256	2	N	25. LOWEST LEVEL 'FLOOR' - EARTH
		3			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
LOFLROTH	257	258	2	N	25. LOWEST LEVEL 'FLOOR'-SOMETHING ELSE
		4			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
GARAGE	259	260	2	N	26. DO YOU HAVE GARAGE OR UNDERGROUND PA
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q26FLAG	261	261	1	N	Flag: 1 if GARAGE=1, 2 otherwise
GRGATCHD	262	263	2	N	27. GARAGE/PARKING STRUCTURE ATTACHED
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
SFCATCHD	264	265	2	N	28. PARKING AREA ON ATTACHED SURFACE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
OTHRSURF	266	267	2	N	29. OTHER CONCRETE/ASPHALT SURFACES ATTA
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
Q29FLAG	268	268	1	N	Flag: 1 if OTHRSURF=1, 2 otherwise
CARPORT	269	270	2	N	30a. ATTACHED TO FOUNDATION : CARPORT
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
DRVWAY	271	272	2	N	30b. ATTACHED TO FOUNDATION : DRIVEWAY
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
SUNRM	273	274	2	N	30c. ATTACHED TO FOUNDATION : SUNROOM
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
PORCH	275	276	2	N	30d. ATTACHED TO FOUNDATION : PORCH
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
PATIO	277	278	2	N	30e. ATTACHED TO FOUNDATION : PATIO
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
WRKSHOP	279	280	2	N	30f. ATTACHED TO FOUNDATION : WORKSHOP
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
SIDEWALK	281	282	2	N	30g. ATTACHED TO FOUNDATION : SIDEWALK
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
OTHRATCH	283	284	2	N	30h. ATTACHED TO FOUNDATION : OTHER
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
MAINHEAT	285	286	2	N	31. DOES THIS HOME HAVE MAIN HEATING SYS
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
Q31FLAG	287	287	1	N	Flag: 1 if MAINHEAT=1, 2 otherwise
RHEATFL	288	289	2	N	Q32: What fuels used for primary heat
		1			= Oil
		2			= Electricity
		3			= Coal
		4			= Kerosene
		5			= Gas or Propane
		6			= Other
		7			= None
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
MUNVKER	290	291	2	N	33-1 MAIN HEAT: UNVENTED KEROSENE SPACE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q33A1	292	292	1	N	Flag: 1 if MUNVKER=1 & MAINHEAT=1, 2 ow
MVKER	293	294	2	N	33-2 MAIN HEAT: VENTED KEROSENE SPACE HE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q33A2	295	295	1	N	Flag: 1 if MVKER=1 & MAINHEAT=1, 2 ow
MUNVGAS	296	297	2	N	33-3 MAIN HEAT: UNVENTED GAS OR PROPANE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
Q33A3	298	298	1	N	Flag: 1 if MUNVGAS=1 & MAINHEAT=1, 2 ow
MVGAS	299	300	2	N	33-4 MAIN HEAT: VENTED GAS OR PROPANE HE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q33A4	301	301	1	N	Flag: 1 if MVGAS=1 & MAINHEAT=1, 2 ow
MWOODST	302	303	2	N	33-5 MAIN HEAT: WOODSTOVE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q33A5	304	304	1	N	Flag: 1 if MWOODST=1 & MAINHEAT=1, 2 ow
MFIREPL	305	306	2	N	33-6 MAIN HEAT: FIREPLACE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q33A6	307	307	1	N	Flag: 1 if MFIREPL=1 & MAINHEAT=1, 2 ow
TMUNVKER	308	309	2	N	33-1 TIME USED: UNVENTED KEROSENE SPACE
		1			= Always/Almost Always
		2			= About Half The Time
		3			= Occasionally
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank



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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
TMVKER	310	311	2	N	33-2 TIME USED: VENTED KEROSENE SPACE HE
		1			= Always/Almost Always
		2			= About Half The Time
		3			= Occasionally
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
TMUNVGAS	312	313	2	N	33-3 TIME USED: UNVENTED GAS OR PROPANE
		1			= Always/Almost Always
		2			= About Half The Time
		3			= Occasionally
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
TMVGAS	314	315	2	N	33-4 TIME USED: VENTED GAS OR PROPANE HE
		1			= Always/Almost Always
		2			= About Half The Time
		3			= Occasionally
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
TMWOODST	316	317	2	N	33-5 TIME USED: WOODSTOVE
		1			= Always/Almost Always
		2			= About Half The Time
		3			= Occasionally
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
TMFIREPL	318	319	2	N	33-6 TIME USED: FIREPLACE
		1			= Always/Almost Always
		2			= About Half The Time
		3			= Occasionally
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
MHEATAIR	320	321	2	N	34. DISTRIBUTION SYSTEM FOR MAIN HEAT SY
		1			= Forced Air
		2			= Hot Water
		3			= Natural Convection
		4			= Something Else
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q34FLAG	322	322	1	N	Flag: 1 if MAINHEAT=1 & MHEATAIR=1, 2 ow
MBSMNTH	323	324	2	N	35. IS MAIN SYSTEM IN BASEMENT OR CRAWL
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
MAIRDUCT	325	326	2	N	36. MAIN - DUCTS RUN UNDER HOUSE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
SUPSYS	327	328	2	N	37. DO YOU USE ANY SUPPLEMENTAL HEATING
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q37FLAG	329	329	1	N	Flag: 1 if SUPSYS=1, 2 otherwise
SUPOIL	330	331	2	N	38. FUEL USED FOR SUPPL. HEAT - OIL
		1			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
SUPELEC	332	333	2	N	38. FUEL USED FOR SUPPL. HEAT - ELECTR
		2			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
SUPCOAL	334	335	2	N	38. FUEL USED FOR SUPPL. HEAT - COAL
		3			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
SUPKERO	336	337	2	N	38. FUEL USED FOR SUPPL. HEAT - KEROSENE
		4			= Yes
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
SUPGAS	338	339	2	N	38. FUEL USED FOR SUPPL. HEAT - GAS
		5			- Yes
		77			- Legitimate Skip
		94			- Don't Know
		95			- Out-of-range Response
		96			- Multiple Response
		97			- Refusal
		98			- Blank
SUPOTH	340	341	2	N	38. FUEL USED FOR SUPPL. HEAT - OTHER
		6			- Yes
		77			- Legitimate Skip
		94			- Don't Know
		95			- Out-of-range Response
		96			- Multiple Response
		97			- Refusal
		98			- Blank
SUPNONE	342	343	2	N	38. FUEL USED FOR SUPPL. HEAT - NONE
		7			- Yes
		77			- Legitimate Skip
		94			- Don't Know
		95			- Out-of-range Response
		96			- Multiple Response
		97			- Refusal
		98			- Blank
SUNVKER	344	345	2	N	39-1 SUPP HEAT: UNVENTED KEROSENE SPACE
		1			- Yes
		2			- No
		77			- Legitimate Skip
		94			- Don't Know
		95			- Out-of-range Response
		96			- Multiple Response
		97			- Refusal
		98			- Blank
Q39A1	346	348	1	N	Flag: 1 if SUNVKER=1 & SUPSYS=1, 2 ow
SVKER	347	348	2	N	39-2 SUPP HEAT: VENTED KEROSENE SPACE HE
		1			- Yes
		2			- No
		77			- Legitimate Skip
		94			- Don't Know
		95			- Out-of-range Response
		96			- Multiple Response
		97			- Refusal
		98			- Blank

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
Q39A2	349	349	1	N	Flag: 1 if SVKER=1 & SUPSYS=1, 2 ow
SUNVGAS	350	351	2	N	39-3 SUPP HEAT: UNVENTED GAS OR PROPANE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q39A3	352	352	1	N	Flag: 1 if SUNVGAS=1 & SUPSYS=1, 2 ow
SVGAS	353	354	2	N	39-4 SUPP HEAT: VENTED GAS OR PROPANE HE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q39A4	355	355	1	N	Flag: 1 if SVGAS=1 & SUPSYS=1, 2 ow
SWOODST	356	357	2	N	39-5 SUPP HEAT: WOODSTOVE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q39A5	358	358	1	N	Flag: 1 if SWOODST=1 & SUPSYS=1, 2 ow
SFIREPL	359	360	2	N	39-6 SUPP HEAT: FIREPLACE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
Q39A6	361	361	1	N	Flag: 1 if SFIREPL=1 & SUPSYS=1, 2 ow
TSUNVKER	362	363	2	N	39-1 TIME USED: UNVENTED KEROSENE SPACE
					1 = Always/Almost Always
					2 = About Half The Time
					3 = Occasionally
					77 = Legitimate Skip
					94 = Don't Know
					95 = Out-of-range Response
					96 = Multiple Response
					97 = Refusal
					98 = Blank
TSVKER	364	365	2	N	39-2 TIME USED: VENTED KEROSENE SPACE HE
					1 = Always/Almost Always
					2 = About Half The Time
					3 = Occasionally
					77 = Legitimate Skip
					94 = Don't Know
					95 = Out-of-range Response
					96 = Multiple Response
					97 = Refusal
					98 = Blank
TSUNVGAS	366	367	2	N	39-3 TIME USED: UNVENTED GAS OR PROPANE
					1 = Always/Almost Always
					2 = About Half The Time
					3 = Occasionally
					77 = Legitimate Skip
					94 = Don't Know
					95 = Out-of-range Response
					96 = Multiple Response
					97 = Refusal
					98 = Blank
TSVGAS	368	369	2	N	39-4 TIME USED: VENTED GAS OR PROPANE HE
					1 = Always/Almost Always
					2 = About Half The Time
					3 = Occasionally
					77 = Legitimate Skip
					94 = Don't Know
					95 = Out-of-range Response
					96 = Multiple Response
					97 = Refusal
					98 = Blank

National Residential Radon Survey  
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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
TSWOODST	370	371	2	N	39-5 TIME USED: WOODSTOVE
		1			= Always/Almost Always
		2			= About Half The Time
		3			= Occasionally
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
TSFIREPL	372	373	2	N	39-6 TIME USED: FIREPLACE
		1			= Always/Almost Always
		2			= About Half The Time
		3			= Occasionally
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
SFRCAIR	374	375	2	N	40a. DISTRIB. FOR SUPPL. HEAT:FORCED AIR
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q40FLAG	376	378	1	N	Flag: 1 If SUPSYS=1 & SFRCAIR=1, 2 ow
SHOTWTR	377	378	2	N	40b. DISTRIB. FOR SUPPL. HEAT:HOT WATER
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

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Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
SCONVEC	379	380	2	N	40c. DISTRIB. FOR SUPPL. HEAT: CONVECTION
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
SOTH	381	382	2	N	40d. DISTRIB. FOR SUPPL. HEAT: OTHER
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
SBSMNTH	383	384	2	N	41. IS SUPPL. SYSTEM IN BASEMENT OR CRAW
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
SAIRDUCT	385	386	2	N	42. SUPPL. - DO DUCTS RUN UNDER HOUSE
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
NUMFIRPL	387	388	2	N	43a. HOW MANY FIREPLACES DO YOU HAVE
Q43AFLAG	389	389	1	N	Flag: 1 If 1<=NUMFIRPL<=12, 2 ow



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Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
DMPRSOPN	390	391	2	N	43b. ARE DAMPERS OPEN WHEN FIREPLACE NOT
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q43BFLAG	392	392	1	N	Flag: 1 if Q43AFLAG=1 & DMPRSOPN=1, 2 ow
TDMPROP	393	394	2	N	43c. HOW OFTEN ARE DAMPERS LEFT OPEN
		1			= Always/All Year
		2			= Almost Always
		3			= About Half of the Time
		4			= Occasionally
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
HUMULTR	395	396	2	N	44a. HUMID. DEVICE: ULTRASONIC HUMIDIFIE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
HUMCOOL	397	398	2	N	44b. HUMID. DEVICE: COOL MIST HUMIDIFIED
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
HUMSTM	399	400	2	N	44c. HUMID. DEVICE: STEAM MIST HUMIDIFIE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
HUMDK	401	402	2	N	44d. HUMID. DEVICE: HUMIDIFIER, DK TYPE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
THUMULTR	403	404	2	N	44a. TIME DEVICE USED: ULTRASONIC HUMIDI
		1			= Daily
		2			= More Than Once Per Week
		3			= Less Than Once Per Week
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
THUMCOOL	405	406	2	N	44b. TIME DEVICE USED: COOL MIST HUMIDIF
		1			= Daily
		2			= More Than Once Per Week
		3			= Less Than Once Per Week
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
THUMSTM	407	408	2	N	44c. TIME DEVICE USED: STEAM MIST HUMIDI
		1			= Daily
		2			= More Than Once Per Week
		3			= Less Than Once Per Week
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
THUMDK	409	410	2	N	44d. TIME DEVICE USED: HUMIDIFIER, DK TY
		1			= Daily
		2			= More Than Once Per Week
		3			= Less Than Once Per Week
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
VNTLATOR	411	412	2	N	45. AIR-TO-AIR HEAT EXCHANGER OR HEAT-RE
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
WTEMPCAT	413	414	2	N	Q46: Winter home temperature, categoriz
		1			= Less Than 64
		2			= 64 to 65
		3			= 66 to 67
		4			= 68 to 69
		5			= 70 to 71
		6			= 72 to 73
		7			= 74 to 75
		8			= 76 to 77
		9			= 78 to 79
		10			= Greater Than or Equal to 80
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

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Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
GASWTHTR	415	416	2	N	47a. GAS APPLIANCES IN HOME: WATER HEATE
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
GASDRYER	417	418	2	N	47b. GAS APPLIANCES IN HOME: CLOTHES DRY
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
GASSTOVE	419	420	2	N	47c. GAS APPLIANCES IN HOME: STOVE
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
GASOVEN	421	422	2	N	47d. GAS APPLIANCES IN HOME: OVEN
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
GASREFRG	423	424	2	N	47e. GAS APPLIANCES IN HOME: REFRIGERATO
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			

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Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
GASAIR	425	426	2	N	47f. GAS APPLIANCES IN HOME: AIR CONDITI
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
GASHTPMP	427	428	2	N	47g. GAS APPLIANCES IN HOME: HEAT PUMP
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
GASOTH	429	430	2	N	47h. GAS APPLIANCES IN HOME: OTHER
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
CNTRLAIR	431	432	2	N	48. DOES THIS HOME HAVE CENTRAL AIR COND
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
WALLAIR	433	434	2	N	48a. OTHER AIR COND. SYSTEMS: WINDOW/WAL
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			

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Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
EVAPAIR	435	436	2	N	49b. OTHER AIR COND. SYSTEMS: SWAMP/EVAP
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
NUMWALL	437	438	2	N	50a. NUMBER USED: WINDOW/WALL MOUNTED UN
NUMEVAP	439	440	2	N	50b. NUMBER USED: SWAMP/EVAPORATIVE COOL
STEMPCAT	441	442	2	N	Q51 Summer home temperature, categorized
		1 = Less Than 64			
		2 = 64 to 65			
		3 = 66 to 67			
		4 = 68 to 69			
		5 = 70 to 71			
		6 = 72 to 73			
		7 = 74 to 75			
		8 = 76 to 77			
		9 = 78 to 79			
		10 = Greater Than or Equal to 80			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
FANSTV	443	444	2	N	52-1 EXHAUST FANS VENTED OUTSIDE: COOK ST
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
FANBTRM	445	446	2	N	52-2 EXHAUST FANS VENTED OUTSIDE: BATHROOM
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
FANDRYR	447	448	2	N	52-3 EXHAUST FANS VENTED OUTSIDE: DRYER
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
TFANSTV	449	450	2	N	52-1 TIMES FAN USED: COOK STOVE
		1			= Whenever Cookstove Used
		2			= Occasionally When Cookstove Used
		3			= Seldom or Almost Never
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
TFANBTRM	451	452	2	N	52-2 TIMES FAN USED: BATHROOM
		1			= Whenever Bathroom Used
		2			= Occasionally When Bathroom Used
		3			= Seldom or Almost Never
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
TFANDRYR	453	454	2	N	52-3 TIMES FAN USED: CLOTHES DRYER
		1			= Daily
		2			= More Than Once Per Week
		3			= Once Per Week or Less
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
WHOLEFAN	455	458	2	N	53. HOME HAVE WHOLE HOUSE EXHAUST FAN
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
Q53FLAG	457	457	1	N	Flag: 1 if WHOLEFAN=1, 2 otherwise
FREQWHOL	458	459	2	N	53a. FREQUENCY-WHOLE HOUSE FAN IN COOLIN
		1			= Use Every Day
		2			= Not Daily But More Than Once a Week
		3			= Use Regularly But Less Than Once a Week
		4			= Seldom or Never Use During Cooling Seaso
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
FREQOTHR	460	461	2	N	53b. FREQUENCY-WHOLE HOUSE FAN IN OTHER
		1			= Use Every Day
		2			= Not Daily But More Than Once a Week
		3			= Use Less Than Once a Week
		4			= Seldom or Never Use During Other Seasons
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
OBLPANE	462	463	2	N	54-1a. DOES HOME HAVE: DOUBLE PANE WINDO
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank



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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
STRMWND	464	465	2	N	54-2a. DOES HOME HAVE: STORM WINDOWS
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
INSLWL	466	467	2	N	54-3a. DOES HOME HAVE: WALL INSULATION
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
INSLCL	468	469	2	N	54-4a. DOES HOME HAVE: CEILING INSULATION
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
STRMDR	470	471	2	N	54-5a. DOES HOME HAVE: STORM DOORS
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			
STRPNG	472	473	2	N	54-6a. DOES HOME HAVE: WEATHER STRIPPING
		1 = Yes			
		2 = No			
		77 = Legitimate Skip			
		94 = Don't Know			
		95 = Out-of-range Response			
		96 = Multiple Response			
		97 = Refusal			
		98 = Blank			

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
PDBLPANE	474	479	6	N2	54-1b. PERCENT OF HOME WITH DOUBLE PANE
PSTRMWND	480	485	6	N2	54-2b. PERCENT OF HOME WITH STORM WINDOW
PINSLWL	486	491	6	N2	54-3b. PERCENT OF HOME WITH WALL INSULAT
PINSLCL	492	497	6	N2	54-4b. PERCENT OF HOME WITH CEILING INSU
PSTRMDR	498	503	6	N2	54-5b. PERCENT OF HOME WITH STORM DOORS
PSTRPNG	504	509	6	N2	54-6b. PERCENT OF HOME WITH WEATHER STRI
TIGHT	510	511	2	N	55. WOULD YOU SAY THAT HOME IS TIGHT OR
					1 = Tight
					2 = Leaky
					3 = Uncertain
					94 = Don't Know
					95 = Out-of-range Response
					96 = Multiple Response
					97 = Refusal
					98 = Blank
HTCLSD01	512	513	2	N	56-01 MONTHS CLOSED FOR HEATING - JAN
					1 = Closed in January
					94 = Don't Know
					95 = Out-of-range Response
					96 = Multiple Response
					97 = Refusal
					98 = Blank
HTCLSD02	514	515	2	N	56-02 MONTHS CLOSED FOR HEATING - FEB
					2 = Closed in February
					94 = Don't Know
					95 = Out-of-range Response
					96 = Multiple Response
					97 = Refusal
					98 = Blank
HTCLSD03	516	517	2	N	56-03 MONTHS CLOSED FOR HEATING - MAR
					3 = Closed in March
					94 = Don't Know
					95 = Out-of-range Response
					96 = Multiple Response
					97 = Refusal
					98 = Blank
HTCLSD04	518	519	2	N	56-04 MONTHS CLOSED FOR HEATING - APR
					4 = Closed in April
					94 = Don't Know
					95 = Out-of-range Response
					96 = Multiple Response
					97 = Refusal
					98 = Blank

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
HTCLSD05	520	521	2	N	56-05 MONTHS CLOSED FOR HEATING - MAY
		5			= Closed in May
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
HTCLSD06	522	523	2	N	56-06 MONTHS CLOSED FOR HEATING - JUNE
		6			= Closed in June
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
HTCLSD07	524	525	2	N	56-07 MONTHS CLOSED FOR HEATING - JULY
		7			= Closed in July
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
HTCLSD08	526	527	2	N	56-08 MONTHS CLOSED FOR HEATING - AUG
		8			= Closed in August
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
HTCLSD09	528	529	2	N	56-09 MONTHS CLOSED FOR HEATING - SEP
		9			= Closed in September
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
HTCLSD10	530	531	2	N	56-10 MONTHS CLOSED FOR HEATING - OCT
		10			= Closed in October
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

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Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
HTCLSD11	532	533	2	N	56-11 MONTHS CLOSED FOR HEATING - NOV
		11			= Closed In November
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
HTCLSD12	534	535	2	N	56-12 MONTHS CLOSED FOR HEATING - DEC
		12			= Closed In December
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
CLCLSD01	536	537	2	N	57-01 MONTHS CLOSED FOR COOLING - JAN
		1			= Closed In January
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
CLCLSD02	538	539	2	N	57-02 MONTHS CLOSED FOR COOLING - FEB
		2			= Closed In February
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
CLCLSD03	540	541	2	N	57-03 MONTHS CLOSED FOR COOLING - MAR
		3			= Closed In March
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
CLCLSD04	542	543	2	N	57-04 MONTHS CLOSED FOR COOLING - APR
		4			= Closed In April
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
CLCLSD05	544	545	2	N	57-05 MONTHS CLOSED FOR COOLING - MAY
		5			= Closed in May
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
CLCLSD06	546	547	2	N	57-06 MONTHS CLOSED FOR COOLING - JUNE
		6			= Closed in June
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
CLCLSD07	548	549	2	N	57-07 MONTHS CLOSED FOR COOLING - JULY
		7			= Closed in July
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
CLCLSD08	550	551	2	N	57-08 MONTHS CLOSED FOR COOLING - AUG
		8			= Closed in August
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
CLCLSD09	552	553	2	N	57-09 MONTHS CLOSED FOR COOLING - SEP
		9			= Closed in September
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
CLCLSD10	554	555	2	N	57-10 MONTHS CLOSED FOR COOLING - OCT
		10			= Closed in October
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
CLCLSD11	556	557	2	N	57-11 MONTHS CLOSED FOR COOLING - NOV
		11			= Closed in November
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
CLCLSD12	558	559	2	N	57-12 MONTHS CLOSED FOR COOLING - DEC
		12			= Closed in December
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
VENTFREQ	560	561	2	N	58. VENTILATION DURING HEATING & COOLING
		1			= Ventilate on a daily basis
		2			= Not daily, but more than once a week
		3			= Regularly, but less than once a week
		4			= Only during specific activities
		5			= Do not ventilate at all
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
OWN_RENT	562	563	2	N	72. CURRENTLY RENTING, OWN, OR BUYING
		1			= Own
		2			= Rent
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank
R_RADTES	564	565	2	N	Q73: Has house been tested for radon
		1			= Yes
		2			= No
		77			= Legitimate Skip
		94			= Don't Know
		95			= Out-of-range Response
		96			= Multiple Response
		97			= Refusal
		98			= Blank

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
Q73FLAG	566	566	1	N	Flag: 1 if R_RADTES=1, 2 otherwise
R_MEASUR	567	568	2	N	Q74: How many measurements taken
R_HIRADL	569	570	2	N	Q75: Was measurement high
					1 = Yes
					2 = No
					77 = Legitimate Skip
					94 = Don't Know
					95 = Out-of-range Response
					96 = Multiple Response
					97 = Refusal
					98 = Blank
R_REDUCE	571	572	2	N	Q76: Was something done to reduce radon
					1 = Yes
					2 = No
					77 = Legitimate Skip
					94 = Don't Know
					95 = Out-of-range Response
					96 = Multiple Response
					97 = Refusal
					98 = Blank
Q76FLAG	573	573	1	N	Flag: 1 if R_REDUCE=1, 2 otherwise
HOWREDUC	574	623	50	A	77. WHAT WAS DONE TO REDUCE RADON LEVELS
AVR10_01	624	624	1	N	1 IF HHMNCAT > 8, 0 OW
					0 = Radon Avg < 10
					1 = Radon Avg > 10
AVR4_01	625	625	1	N	1 IF HHMNCAT > 4, 0 OW
					0 = Radon Average < 4
					1 = Radon Average > 4
LLR10_01	626	626	1	N	1 IF LL_PCLY GT 10, 0 OW
					0 = Low level > 10
					1 = Low level < 10
LLR4_01	627	627	1	N	1 IF LL_PCLY GT 4, 0 OW
					0 = Low level > 4
					1 = Low level < 4
LL_PCLY	628	637	10	N6	RADON MEAS. IN LOWST HH LEV (=R_PCLY)
LOGLLPCL	638	646	9	N6	LOG of RLL_PCLY
AIRTOAIR	647	647	1	N	Q45: Does home have air-to-air heat exch
					0 = No
					1 = Yes

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
ATTACHED	648	648	1	N	Q26,28: Is concrete garage base attached 0 = No 1 = Yes
BELOWGRD	649	649	1	N	Q23: Is level one of residence below grd 0 = No 1 = Yes
BMTDOOR	650	650	1	N	Q8,9: Does inside bmt entrance have door 0 = No 1 = Yes
BMTENTER	651	651	1	N	Q8,9: Can enter basement inside home 0 = No 1 = Yes
B_AGE_LN	652	653	2	N	Q6: Linear contrast for BLDG_AGE
B_AGE_QD	654	655	2	N	Q6: Quadratic contrast for BLDG_AGE
B_AGE_QU	656	657	2	N	Q6: Cubic contrast for BLDG_AGE
CENTAIR	658	658	1	N	Q48: Does residence have central air 0 = No 1 = Yes
COOLCLQD	659	660	2	N	Q57: Squared term for COOLCLS2
COOLCLS2	661	662	2	N	Q57: No. of months closed - cooling sea.
EPARP_LN	663	664	2	N	Linear contrast for EPARPCAT
EPARP_QD	665	666	2	N	Quadratic contrast for EPARPCAT
FIREPLAC	667	667	1	N	Q54a: No. fireplaces in home (0, 1, 2+) 0 = Zero Fireplaces 1 = One Fireplaces 2 = Two or more Fireplaces
HEATCLQD	668	669	2	N	HEATCLS2 squared
HEATCLS2	670	671	2	N	Recoded and centered at 5 HEATCLSD
LIVINGSP	672	672	1	N	Q24: Is lowest level living space 0 = L1 is living space 1 = L1 not living space
LOC_MDIS	673	673	1	N	Q34,35: Primary forced air system in bmt 0 = No 1 = Yes
LOC_SDIS	674	674	1	N	Q40a,41: Supp. forced air system in bmt 0 = No 1 = Yes
MOBILE	675	675	1	N	Q1: Is residence mobile home 0 = No 1 = Yes



National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
MULTI	676	676	1	N	Q1: Is residence in multi unit building 0 = No 1 = Yes
NUMATCH2	677	677	1	N	Q29,30: No. of attachs. to foundation 0 = Zero Attachments 1 = One Attachment 2 = Two Attachments 3 = Three Attachments 4 = Four Attachments 5 = Five or More Attachments
NUMATQD	678	679	2	N	NUMATCH2 squared
NUMGASA2	680	680	1	N	Q47: No. of gas appliances used in home 0 = 0 Gas Appliances 1 = 1 Gas Appliance 2 = 2 Gas Appliances 3 = 3 Gas Appliances 4 = 4 or more Gas Appliances
OTHEAIR	681	681	1	N	Q49: Does home have window/wall unit 0 = No 1 = Yes
PCONVEC	682	682	1	N	Q34: Is primary dist. sys. natural conv. 0 = No 1 = Yes
PELECHS	683	683	1	N	Q32: Is primary heat. sys. electric 0 = No 1 = Yes
PFRCAIR	684	684	1	N	Q34: Is primary dist. sys. forced air 0 = No 1 = Yes
PFRCDUC	685	685	1	N	Q34,37: If prim. dist. sys. has ducts 0 = No 1 = Yes
PHCOMUNV	686	686	1	N	Q32,33a,b: Prim. heat. sys. comb. & unv 0 = No 1 = Yes
PHCONVEN	687	687	1	N	Q32,33a,b: Prim. heat. sys. comb. & vent 0 = No 1 = Yes

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
POILHS	688	688	1	N	Q32: Is prim. heating system oil
		0 = No			
		1 = Yes			
POTHER	689	689	1	N	Q34: Is prim. heat. sys. hot water/other
		0 = No			
		1 = Yes			
RHOMLVOD	690	691	2	N	R_HOMLEV squared
R_PCTBMT	692	697	6	N2	Q21: Percent foundation basement
R_PCTCRL	698	703	6	N2	Q21: Percent foundation crawlspace
R_PCTOPN	704	709	6	N2	Q21: Percent foundation open air
R_PCTQTR	710	715	6	N2	Q21: Percent foundation something else
R_PCTSLB	716	721	6	N2	Q21: Percent foundation slab-on-grade
SCONVEC1	722	722	1	N	Q40c: Is supp. dist. sys. natural conv.
		0 = No			
		1 = Yes			
SELECHS	723	723	1	N	Q38: Is supp. heat. sys. electricity
		0 = No			
		1 = Yes			
SFRCAIR1	724	724	1	N	Q40a: Is supp. dist. sys. forced air
		0 = No			
		1 = Yes			
SFRCDUC	725	725	1	N	Q40a,42: Supp. forced air sys has ducts
		0 = No			
		1 = Yes			
SHCOMUNV	726	726	1	N	Q38,39a,b: Is supp. sys. comb. & unvent
		0 = No			
		1 = Yes			
SHCOMVEN	727	727	1	N	Q38,39a,b: Is supp. sys. comb. & vented
		0 = No			
		1 = Yes			
SINGLE	728	728	1	N	Q1: Is residence a single-family unit
		0 = No			
		1 = Yes			
SOILHS	729	729	1	N	Q38: Is supp. heat. sys. oil
		0 = No			
		1 = Yes			
SOTHER	730	730	1	N	Q40b,d: Supp. dist. sys. hot water/other
		0 = No			
		1 = Yes			

National Residential Radon Survey  
Household Level Data File

Variable Label	Beginning Column	Ending Column	Length	Type	Variable Description
TIGHT_LN	731	732	2	N	Q55: Linear contrast for TIGHT
TIGHT_QD	733	734	2	N	Q55: Quadratic contrast for TIGHT
TIMEDMPR	735	735	1	N	Q43c: Are dampers open at least half tim
		0 = No			
		1 = Yes			
UPPERFL	736	736	1	N	Flag: 1 if multi unit, and LOWFLOR >= 2
		0 = 2nd Floor lowest			
		1 = 1st Floor lowest			
VNTFR_LN	737	738	2	N	Q58: Linear contrast for VENTFREQ
VNTFR_QD	739	740	2	N	Q58: Quadratic contrast for VENTFREQ
VNTFR_QU	741	742	2	N	Q58: Cubic contrast for VENTFREQ
WINTER	743	744	2	N	Q46: Average winter temp. in home
PARTID	745	754	10	A	ID NUMBER (CHECK DIGITED)
SSUID	755	764	10	A	Secondary Sampling Unit
FLAGBASE	765	765	1	N	Flag > 0 if basement recoded
FLAGBLO	766	766	1	N	Flag > 0 if level below ground recoded
FLAGBSMT	767	767	1	N	Flag > 0 if R_BASEMT recoded
FLAGCOLS	768	768	1	N	Flag > 0 if HOMECOLS recoded
FLAGCRWL	769	769	1	N	Flag > 0 if CRAWLSPC recodes
FLAGHOME	770	770	1	N	Flag > 0 if home levels recoded
FLAGRESI	771	771	1	N	Flag > 0 if residence recoded
FLAGSLAB	772	772	1	N	Flag > 0 if HOMESLAB recoded
FLGSURC	773	773	1	N	Flag > 0 if CRLSUREC recoded
FLGMULTI	774	774	1	N	flag=1 if Multi pcts OK, not recoded
FLGPCTBA	775	775	1	N	flag=1 if % basement recoded
FLGPCTCR	776	776	1	N	flag=1 if % crawlspace recoded
FLGPCTOP	777	777	1	N	flag=1 if % open recoded
FLGPCTSL	778	778	1	N	flag=1 if % slab recoded



## **APPENDIX C**

### **NRRS SURVEY QUESTIONNAIRE**



OMB Number: 2060-0173  
Expires: January 23, 1991

QUESTIONNAIRE  
THE NATIONAL RESIDENTIAL RADON SURVEY

Sponsored by  
U.S. Environmental Protection Agency

The purpose of this study is to determine the extent of radon concentrations in residential structures throughout the United States. Radon is a radioactive gas that occurs naturally in soil and rocks and in building materials. Your household was randomly selected for this important study.

PLACE ID LABEL HERE

Interviewer Name: \_\_\_\_\_ Time Interview Began: \_\_\_\_\_ am/pm  
Date of Interview: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time Interview Ended: \_\_\_\_\_ am/pm  
Mo Day Yr





1. IF READILY OBSERVABLE, DO NOT ASK.

Which of the following best describes this residence?

[CIRCLE ONE]  
A multi-unit building.....01 → GO TO Q3  
A mobile home.....02 → GO TO Q6  
A single unit, detached dwelling....03 → GO TO Q2

2. Which of the following house-types best describes this house...

[CIRCLE ONE]  
Ranch style or 1 story.....01  
Split level.....02  
Split foyer.....03 } → Q6  
2 story.....04  
3 or more stories.....05 }

3. How many housing units are in this building?

     /      /      HOUSING UNITS  
DK.....94  
RE.....97

4. How many floors are in this building, including any below ground?

     /      FLOORS  
DK.....94  
RE.....97

5. In this building, on which floor is the lowest level of your home located?

     /      LOWEST LEVEL OF HOME IN BUILDING  
DK.....94  
RE.....97

6. About how old is this (home/building)?

LESS THAN 1 YEAR OLD.....01  
1-5 YEARS OLD.....02  
6-10 YEARS OLD.....03  
11-20 YEARS OLD.....04  
21-40 YEARS OLD.....05  
OVER 40 YEARS OLD.....06  
DK.....94  
RE.....97

7. Do you have a full or partial basement, a cellar, or a level of the house that has one or more walls partially or completely below ground level? (PROBE: A level is the area within a home that is all of the same height and is not separated by any stairs. This level is either liveable or potentially liveable space and does not include crawl spaces.)

YES.....01 → CONTINUE

NO.....02  
DK.....94  
RE.....97 } → Q12

8. For the purpose of this study we are calling the floor or level that has one or more walls partially or completely below ground a basement. Can you enter the area we are calling a basement from inside your home?

YES.....01 → CONTINUE

NO.....02  
DK.....94  
RE.....97 } → Q10

9. Is there a door that can be closed between what we are calling the basement and the next higher level?

YES.....01

NO.....02

DK.....94

RE.....97

10. Which of the following describes the construction of most of the outside basement walls? Are they mostly made of...

[CIRCLE ALL THAT APPLY]

concrete block or cinder block.....01  
poured concrete.....02  
stone and mortar.....03  
wood.....04  
brick/brick veneer.....05  
earth/dirt or.....06  
something else .....07 → [SPECIFY] \_\_\_\_\_ / \_\_\_\_  
DK.....94  
RE.....97

11. Is any part of your basement floor exposed earth?

YES.....01  
NO.....02  
DK.....94  
RE.....97

12. Is any part of this home, excluding the basement, on a concrete slab?  
[IF MOBILE HOME: AXLE OR WHEELS RESTING ON CONCRETE PAD SHOULD BE CODED AS A "NO".]

YES.....01  
NO.....02  
DK.....94  
RE.....97

13. Is any part of your home over a crawl space? (PROBE: A crawl space is space between the ground and the floor structure that cannot be occupied. This is space other than a basement or cellar.)

YES.....01 → CONTINUE  
NO.....02 }  
DK.....94 } → Q20  
RE.....97 }

14. Does any part of the crawl space have exposed or visible earth, sand or rock?

YES.....01 → CONTINUE

NO.....02 }  
DK.....94 } → Q15  
RE.....97 }

14a. What, if anything, covers all or part of the surface of your crawl space?

\_\_\_\_\_ / \_\_\_\_\_

15. How much of the crawl space is enclosed by foundation walls- all, part or none?

ALL.....01 }  
PART.....02 } → CONTINUE  
NONE.....03 }  
DK.....94 } → Q20  
RE.....97 }

16. Which of the following describes the construction of most of the outside foundation or crawl space walls? Are they mostly made of....

[CIRCLE ALL THAT APPLY]

concrete block or cinder block.....01

poured concrete.....02

stone and mortar.....03

wood.....04

brick/brick veneer.....05

earth/dirt or.....06

something else .....07 → [SPECIFY] \_\_\_\_\_ / \_\_\_\_\_

DK.....94

RE.....97

17. Can you enter any part of the enclosed crawl space without going outside the house?

YES.....01

NO.....02

DK.....94

RE.....97

18. Are there air vents in the foundation walls of the crawl space?

YES.....01 → CONTINUE

NO.....02

DK.....94

RE.....97

} → Q20

19. What percentage of the time during the year are the vents open? ENTER WHOLE NUMBERS.

     /      /      PERCENT

DK.....94

RE.....97

20. Is any part of your home over open air, that is, on blocks, or pillars?  
(PROMPT: These may also be know as columns, pylons, or piers)

YES.....01

NO.....02

DK.....94

RE.....97

21. What percent of your home rests over a....

- a. basement.....    /   /    %  
b. concrete slab.....    /   /    %  
c. crawl space.....    /   /    %  
d. open air.....    /   /    %  
e. something else....    /   /    % → [SPECIFY]                         /     
f. DK.....    /   /    %  
g. RE.....    /   /    %

(INTERVIEWER: THESE PERCENTAGES MUST ADD UP TO  
100%. IF NOT, RECALCULATE OR PROBE AS NECESSARY.)

READ TO RESPONDENT:

Radon levels tend to be different in different levels of homes. We need to determine how many levels or floors your home has. A level is the area within a home that is all at the same height and is not separated by any stairs. We are not counting as separate levels such things as sunken living rooms or sunken foyers.

22. How many levels or floors are in your home? (PROBE: This includes basement or cellar, but not the crawl space.) [CIRCLE ANSWER BELOW AND RECORD ANSWER IN BOX AT THE INTERVIEWER CHECKPOINT ON PAGE 21.]

[CIRCLE ONE]

- One level.....01  
Two levels.....02  
Three levels.....03  
Four levels.....04  
Five levels.....05  
Six levels.....06  
DK.....94  
RE.....97

23. Which of these levels has one or more walls partially or completely below ground?

[CIRCLE ALL THAT APPLY]

Level one.....01  
Level two.....02  
Level three.....03  
Level four.....04  
Level five.....05  
Level six.....06  
None.....00  
DK.....94  
RE.....97

24. We are interested in the levels of your home that are used as living quarters. By living quarters we mean the rooms in which you sleep, eat, watch television, or do other activities of daily life. Starting with the lowest level of your home as level one, which of these levels do you use as living quarters? (PROBE: Remember, this includes the basement or cellar if it is used as living quarters.)

[CIRCLE ALL THAT APPLY]

Level one.....01  
Level two.....02  
Level three.....03  
Level four.....04  
Level five.....05  
Level six.....06  
None.....00  
DK.....94  
RE.....97

25. Think about the building material used for the floor of the lowest level of your home, or what we think of as your primary radon barrier. Which of the following building materials makes up your lowest level floor?

[CIRCLE ALL THAT APPLY]

poured concrete.....01

wood.....02

earth, or.....03

something else.....04 → [SPECIFY] \_\_\_\_\_ / \_\_\_\_\_

DK.....94

RE.....97

26. Do you have a garage or underground parking structure?

YES.....01 → CONTINUE

NO.....02

DK.....94 } → Q29

RE.....97 }

27. Is this garage or underground parking structure attached to your home?

YES.....01

NO.....02

DK.....94

RE.....97

28. Does this garage or underground parking structure rest on a concrete or asphalt surface that is attached to or bordering the foundation of your home? (PROBE: Bordering means actually touching the foundation.)

YES.....01

NO.....02

DK.....94

RE.....97



29. Are there any other concrete or asphalt surfaces attached to or bordering the foundation of your home? (PROBE: Bordering means actually touching the foundation and includes such things as a carport or a patio.)

YES.....01 → CONTINUE

NO.....02  
DK.....94  
RE.....97 } → Q31

30. Which of the following structures are attached to or border the foundation of your home? [CIRCLE ONE RESPONSE FOR EACH ITEM, a-h]

	Yes	No	DK	RE
a. carport.....	01.....	02.....	94.....	97
b. driveway.....	01.....	02.....	94.....	97
c. sunroom.....	01.....	02.....	94.....	97
d. porch (slab on grade, only)....	01.....	02.....	94.....	97
e. patio.....	01.....	02.....	94.....	97
f. workshop.....	01.....	02.....	94.....	97
g. sidewalk.....	01.....	02.....	94.....	97
h. anything else?.....	01.....	02.....	94.....	97

↓  
[IF YES, SPECIFY] \_\_\_\_\_ / \_\_\_\_\_

31. The next few questions are about the heating, air conditioning and ventilation systems in your home. Does this home have a main or primary heating system?

YES.....01 → CONTINUE

NO.....02  
DK.....94  
RE.....97 } → Q37

32. Which one of the following fuels do you use for your main or primary heating system?

[CIRCLE ONE]

oil.....01  
 electricity.....02  
 coal.....03  
 kerosene.....04  
 gas or propane.....05  
 other.....06  
 none used.....07  
 DK.....94  
 RE.....97

→ [SPECIFY] \_\_\_\_\_ / \_\_\_\_\_

33a. Do you use the following appliances for main or primary heat during the heating season?

FOR EACH YES CIRCLED, ASK:

33b. Do you use this (NAME)...

	YES	NO	DK	RE	ALWAYS/ ALMOST ALWAYS	ABOUT HALF THE TIME	OCCASSION- ALLY	DK	RE
1. unvented kerosene space heater	01	02	94	97	01	02	03	94	97
2. kerosene space heater vented to the outside	01	02	94	97	01	02	03	94	97
3. unvented gas or propane space heater	01	02	94	97	01	02	03	94	97
4. gas or propane heater vented to the outside	01	02	94	97	01	02	03	94	97
5. woodstove	01	02	94	97	01	02	03	94	97
6. fireplace	01	02	94	97	01	02	03	94	97

34. Which one of the following best describes the type of distribution system you use for your main or primary heating system?

forced air.....01	→ CONTINUE
hot water (i.e. radiator or baseboard).....02	} → Q37
natural convection (i.e. fireplace, woodstove or floor furnace: without a blower).....03	
or, something else.....04	
↓ [SPECIFY] _____ / _____	
DK.....94	
RE.....97	

35. Is this system in a basement or crawl space?

YES.....01  
NO.....02  
DK.....94  
RE.....97

36. Do any ducts carrying the air for this system run under the house?

YES.....01  
NO.....02  
DK.....94  
RE.....97

37. Do you use any supplemental system to heat your home?

YES.....01	→ CONTINUE
NO.....02	} → Q43
DK.....94	
RE.....97	

38. Which of these other fuels are used for supplemental heat?

[CIRCLE ALL THAT APPLY]

oil.....01

electricity....02

coal.....03

kerosene.....04

gas or propane.05

other.....06 → [SPECIFY] \_\_\_\_\_/\_\_\_\_

none used.....07

DK.....94

RE.....97

39a. Do you use the following appliances for supplemental heat during the heating season?

FOR EACH YES CIRCLED, ASK:

39b. Do you use this (NAME)...

	YES	NO	DK	RE	ALWAYS/ ALMOST ALWAYS	ABOUT HALF THE TIME	OCCASION- ALLY	DK	RE
1. unvented kerosene space heater	01	02	94	97	01	02	03	94	97
2. kerosene space heater vented to the outside	01	02	94	97	01	02	03	94	97
3. unvented gas or propane space heater	01	02	94	97	01	02	03	94	97
4. gas or propane heater vented to the outside	01	02	94	97	01	02	03	94	97
5. woodstove	01	02	94	97	01	02	03	94	97
6. fireplace	01	02	94	97	01	02	03	94	97

40. Do you use any of the following distribution systems for supplemental heat?

	YES	NO	DK	RE
a. forced air.....	01.....	02.....	94.....	97
b. hot water.....	01.....	02.....	94.....	97
c. natural convection (fireplace, woodstove, floor furnace, without blower).....	01.....	02.....	94.....	97
d. something else.....	01.....	02.....	94.....	97

↓  
[SPECIFY] \_\_\_\_\_ / \_\_\_\_\_

[IF YES TO Q40A CONTINUE; IF NO, DK OR RE TO Q40A → Q43a]

41. Is this system in a basement or crawl space?

YES.....	01
NO.....	02
DK.....	94
RE.....	97

42. Do any ducts carrying the air for this system run under the house?

YES.....	01
NO.....	02
DK.....	94
RE.....	97

43a. How many fireplaces do you have?

None.....	00
DK.....	94
RE.....	97

} → Q44a

43b. Are the chimney dampers left open during the time the fireplace is not being used?

Yes.....01 → Q44a

No.....02

DK.....94

RE.....97

43c. How often are the chimney dampers left open?

Always/All year.....01

Almost always.....02

About half of the time.....03

Occasionally.....04

DK.....94

RE.....97

44a. Do you use any of the following humidification devices during the heating season?

FOR EACH YES CIRCLED, ASK:

44b. Do you use this (NAME)....

	YES	NO	DK	RE	DAILY	MORE THAN ONCE PER/WK	LESS THAN ONCE PER/WK	DK	RE
a. ultrasonic humidifier (PROBE: This humidifier reduces water to a fine spray using ultrasound; ultrasound is inaudible to the human ear.)	01	02	94	97	01	02	03	94	97
b. cool mist humidifier (PROBE: This humidifier uses the blade of a rotor to spray small droplets of water into the air.)	01	02	94	97	01	02	03	94	97
c. steam mist humidifier (PROBE: This humidifier uses a heating coil to create steam.)	01	02	94	97	01	02	03	94	97
d. humidifier, DK type	01	02	94	97	01	02	03	94	97

45. Is there an air-to-air heat exchanger or heat-recovery ventilator in your home?  
(PROBE: This is a system that blows stale air out of the house, brings in fresh air from outside, and transfers heat from the stale air to the fresh air.)

YES.....01  
NO.....02  
DK.....94  
RE.....97

46. On the average, what temperature do you usually keep your entire home in the winter? [USE MARGIN/MARGINAL NOTES TO CALCULATE AVERAGE TEMPERATURE.]

\_\_\_/\_\_\_ DEGREES

DK.....94  
RE.....97

47. Do you have any of the following gas or propane fueled appliances inside this home? [CIRCLE ONE RESPONSE FOR EACH ITEM.]

	YES	NO	DK	RE
a. water heater.....	01.....	02.....	94.....	97.....
b. clothes dryer.....	01.....	02.....	94.....	97.....
c. stove.....	01.....	02.....	94.....	97.....
d. oven.....	01.....	02.....	94.....	97.....
e. refrigerator.....	01.....	02.....	94.....	97.....
f. air conditioner.....	01.....	02.....	94.....	97.....
g. heat pump.....	01.....	02.....	94.....	97.....
h. other.....	01.....	02.....	94.....	97.....

↓  
[SPECIFY] \_\_\_\_\_

48. Does this home have a central air conditioning system?

YES.....01  
NO.....02  
DK.....94  
RE.....97

49. Do you use any of these other air conditioning systems? [IF YES TO A OR B, ASK NUMBER USED AND ENTER AT Q50 FOR THE APPROPRIATE ITEM(S). IF NO TO A AND B, GO TO Q51.]

Q49				Q50
DK	RE	NO	YES	NUMBER USED
a.	window or wall mounted.....94.....97.....02.....01	→	___/___	
	unit(s)			
b.	swamp or evaporative coolers..94.....97.....02.....01	→	___/___	

51. On the average, what temperature do you usually keep your entire home in the summer? [USE MARGIN/MARGINAL NOTES TO CALCULATE AVERAGE TEMPERATURE.]

\_\_\_/\_\_\_ DEGREES

DK.....94

RE.....97

- 52a. Some stove fans or bathroom fans simply blow air through a filter, or blow exhaust to an unvented attic. They do not blow air or exhausts out of the house. For this question, we are only interested in exhaust fans which are vented to a vented attic or to the outside.

Do you use these built in exhaust fans vented to the outside?

FOR EACH YES CIRCLED, ASK:

52b. Do you use this (NAME)...

	YES	NO	DK	RE	WHENEVER COOKSTOVE USED	OCCASIONALLY WHEN COOKSTOVE USED	SELDOM OR ALMOST NEVER	DK	RE
1. cook stove exhaust fans	01	02	94	97	01	02	03	94	97
					WHENEVER BATHROOM USED	OCCASIONALLY WHEN BATHROOM USED	SELDOM OR ALMOST NEVER	DK	RE
2. bathroom exhaust fans	01	02	94	97	01	02	03	94	97
					DAILY	MORE THAN ONCE PER WEEK	ONCE PER WEEK OR LESS	DK	RE
3. clothes dryer	01	02	94	97	01	02	03	94	97



53. Does your home have a whole house exhaust fan which blows air out of the home?

YES..... 01

NO..... 02 }  
DK..... 94 } → 54a  
RE..... 97 }

53a. How frequently do you use the whole house fan in the cooling season:

Use every day..... 01

Not daily but more than once a week..... 02

Use regularly but less than once a week..... 03

Seldom or never use during cooling season..... 04

DK..... 94

RE..... 97

53b. How frequently do you use the whole house fan during other seasons?

Use every day..... 01

Not daily but more than once a week..... 02

Use less than once a week..... 03

Seldom or never use during other seasons..... 04

DK..... 94

RE..... 97

54a. Does this home have...

FOR EACH YES CIRCLED, ASK:

54b. What percent of your home has (TERM)?

	YES	NO	DK	RE	PERCENT	DK	RE
1. double pane windows	01	02	94	97	___/___/___%	94	97
2. storm windows	01	02	94	97	___/___/___%	94	97
3. insulation in the walls	01	02	94	97	___/___/___%	94	97
4. insulation in the ceiling	01	02	94	97	___/___/___%	94	97
5. storm doors	01	02	94	97	___/___/___%	94	97
6. weather stripping	01	02	94	97	___/___/___%	94	97

55. All things considered regarding the insulation and weatherization of your home, would you say that your home is tight, leaky, or are you uncertain about the tightness of your home?

TIGHT.....01  
 LEAKY.....02  
 UNCERTAIN.....03  
 RE.....97

56. Which months of the year is your home usually closed up for the heating season, that is, your windows and doors are usually kept closed?  
 [CIRCLE ALL THAT APPLY]

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
01	02	03	04	05	06	07	08	09	10	11	12

57. Which months of the year is your home usually closed up for the cooling season, that is, your windows and doors are usually kept closed?  
[CIRCLE ALL THAT APPLY]

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
01	02	03	04	05	06	07	08	09	10	11	12

58. During the time when your home is usually closed for the heating and cooling seasons, you may take steps to ventilate your home. This may involve such things as opening windows when cleaning, cooking, using insecticides, etc. Which of the following best describes your ventilation practices during heating and cooling seasons?

Do you....

ventilate on a daily basis.....	01
not daily, but more than once a week.....	02
regularly, but less than once a week.....	03
only during specific activities.....	04
do not ventilate at all.....	05
DK.....	94
RE.....	97

**READ TO RESPONDENT:**

In order to get estimates of individual exposure to radon, I need to ask some questions about the people who usually live here. First I will ask some background questions about these people and then ask where they spend their time in the house.

[RECORD ANSWERS ON NEXT PAGE]

59. How many people live in this household?
  60. Starting with you, tell me the first names of the people who live in this household. After your name, let's begin with the oldest and work down to the youngest.
  61. Next, I need [your/NAME'S] age on [your/their] last birthday.
  62. [IF NOT OBVIOUS ASK] Is (NAME) male or female?
  63. How many years and months (have you/has NAME) lived in this home?
  64. (Do you/Does NAME) smoke cigarettes?
- [ASK Q65, Q66 AND Q67 FOR EACH "YES" IN Q64]
65. On average, how many packs or partial packs of cigarettes (do you/does NAME) smoke during a typical week?
  66. On average, how many cigarettes (do you/does NAME) smoke in the home during a typical 24-hour weekday?
  67. On average, how many cigarettes (do you/does NAME) smoke in the home during a typical 24-hour weekend day?

**INTERVIEWER INSTRUCTION:** ASK QUESTIONS 68 THROUGH 71 FOR R, THEN PROCEED WITH QUESTIONS 68 THROUGH 71 FOR EACH ADDITIONAL MEMBER OF THE HOUSEHOLD, ONE PERSON AT A TIME]

68. Think about a usual Monday through Friday. During a typical 24-hour weekday, how many hours (do you/does NAME) spend in the house, on the average?
69. Of the (number) weekday hours (you/NAME) spend in the home, how many hours (do you/does NAME) spend on the (first/second/etc.) level of your home?
70. Think about a usual Saturday and Sunday. During a typical 24-hour weekend day, how many hours (do you/does NAME) spend in the house, on the average?
71. Of the (number) hours (you/NAME) spend in the home on a typical weekend day, how many hours (do you/does NAME) spend on the (first/ second/etc.) level of your home?

INTERVIEW CHECK POINT: RECORD NUMBER OF LEVELS INDICATED IN Q6 HERE.

Q59. Number People in Household:		Q60.		Q61.		Q62.		Q63.		Q64.		Q65.		Q66/Q67.		Q68.		Q69.		Q70.		Q71.			
First Name: (Respondent First, then Oldest to Youngest)		Age:		Sex:		Years and Months Lived Here		Cigarettes: Yes - 1 No - 2		Average Packs Per Week (One Decimal)		Average # Cigarettes Smoked in House Per: Week Week Day Week		Average Weekday (24) Hours in House		Average Weekday (24) Hours in House		Average Weekend Day (24) Hours in House		Weekend Hours by Level		Weekend Hours by Level			
		Male-1 Female-2		Male Female		Male Female		Male Female		Male Female		Male Female		Male Female		Male Female		Male Female		Male Female		Male Female		Male Female	
1.																									
2.																									
3.																									
4.																									
5.																									
6.																									
7.																									
8.																									
9.																									
10.																									

\* NUMBER SICKED

None.....01  
1-5.....02  
6-10.....03  
11-20.....04  
Over 20.....05

72. Are you currently renting this home or is it owned or being bought by you?

OWN.....01

RENT.....02 → Landlord: \_\_\_\_\_

DK.....94 Address: \_\_\_\_\_

RE.....97 \_\_\_\_\_

73. Finally we would like to ask about any other radon testing. Has your home been tested for radon in the past?

YES.....01 → CONTINUE

NO.....02

DK.....94

RE.....97

} → SCRIPT ON THE NEXT PAGE

74. How many measurements have been taken?

1

DK.....94

RE.....97

75. Did (any of) the tests indicate that the radon levels in your home were high or elevated?

YES.....01

NO.....02

DK.....94

RE.....97

76. Have you had anything done to reduce the levels of radon in your home?

YES.....01 → CONTINUE

NO.....02

DK.....94

RE.....97

} → SCRIPT ON THE NEXT PAGE

77. What was done? \_\_\_\_\_

SCRIPT: READ TO RESPONDENT

That's all the questions I have. There are just two more tasks I have to do -- place the detectors and get your full name, mailing address, and telephone number.

To obtain accurate measurements, the detectors should remain in place for approximately 12 months. At that time, we will send you instructions on how to package and return them. We will also send you postage-paid envelopes for their return.

PLACE DETECTORS AND ENTER INFORMATION BELOW. FOR EACH DETECTOR, PLACE THE EXTRA LABEL IN THE FOIL BAG IN THE SPACE PROVIDED, RECORD THE TWO DIGIT LEVEL NUMBER AND CIRCLE V FOR VERTICAL PLACEMENT OR H FOR HORIZONTAL PLACEMENT.)

	DETECTOR ID#	LEVEL	V	H	DUPLICATE DETECTOR ID #
#1	_____	__ __	1	2	#1. _____
#2	_____	__ __	1	2	#2. _____
#3	_____	__ __	1	2	#3. _____
#4	_____	__ __	1	2	#4. _____

- 01 = Level One
- 02 = Level Two
- 03 = Level Three
- 04 = Level Four

Date Detectors Placed \_\_\_\_/\_\_\_\_/\_\_\_\_  
MO DA YR

CIRCLE THE OPTION USED TO PLACE EACH DETECTOR. (ONE NUMBER SHOULD BE CIRCLED IN EACH COLUMN UP TO THE NUMBER OF DETECTORS PLACED IN THE HOME. BE SURE TO CIRCLE FOR THE ORIGINAL OR REGULAR DETECTORS ON THE LEFT AND FOR DUPLICATES ONLY ON THE RIGHT.)

	Originals				Duplicates			
	01	02	03	04	01	02	03	04
1st Choice • place in a vertical position, tacked or taped to a wall.	01	01	01	01	01	01	01	01
2nd Choice • place vertically on a shelf.	02	02	02	02	02	02	02	02
3rd Choice • place vertically on a shelf, closer to ceiling than 8".	03	03	03	03	03	03	03	03
4th Choice • place horizontally on a shelf, no closer than 8" to the ceiling.	04	04	04	04	04	04	04	04
5th Choice • place vertically on a wall or shelf in a high traffic area.	05	05	05	05	05	05	05	05
6th Choice • place horizontally on a shelf in a high traffic area.	06	06	06	06	06	06	06	06

CIRCLE ONE NUMBER FOR EACH DETECTOR TO INDICATE WHO PLACED IT. (ONE NUMBER SHOULD BE CIRCLED IN EACH COLUMN UP TO THE NUMBER OF DETECTORS PLACED IN THE HOME. BE SURE TO CIRCLE FOR THE ORIGINAL OR REGULAR DETECTORS ON THE LEFT AND FOR DUPLICATES ONLY ON THE RIGHT.)

	DETECTORS Originals				Duplicates			
	01	02	03	04	01	02	03	04
PLACED BY RESPONDENT WITH INTERVIEWER DIRECTION...	01	01	01	01	01	01	01	01
PLACED BY INTERVIEWER.....	02	02	02	02	02	02	02	02
PLACED BY RESPONDENT ALONE.....	03	03	03	03	03	03	03	03
PLACEMENT REFUSED.....	04	04	04	04	04	04	04	04
DETECTORS NOT PLACED BECAUSE RESPONDENT..... PHYSICALLY/MENTALLY INCAPACITATED	05	05	05	05	05	05	05	05
OTHER (EXPLAIN IN FULL BELOW).....	06	06	06	06	06	06	06	06
_____								
_____								
_____								

NOTE:  
WHEN YOU HAVE COMPLETED THE QUESTIONNAIRE, BE SURE TO COMPLETE PART E OF THE SCREENING FORM.